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NATURAL HISTORY

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BRITISH MUSEUM
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# THE EVOLUTION AND DISPERSAL OF THE GRASSLAND LEAFHOPPER GENUS *EXITIANUS*, WITH KEYS TO THE OLD WORLD SPECIES (CICADELLIDAE: HEMIPTERA)

H. H. ROSS

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BY

H. H. ROSS

Illinois Natural History Survey, Urbana

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# THE EVOLUTION AND DISPERSAL OF THE GRASSLAND LEAFHOPPER GENUS *EXITIANUS*, WITH KEYS TO THE OLD WORLD SPECIES (CICADELLIDAE: HEMIPTERA)*

*By* H. H. ROSS

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## SYNOPSIS

Keys and illustrations are presented for the identification of the five species-groups of *Exitianus* and for the identification of the species occurring in the Old World, the latter including seventeen species, nine new to science. Synonymy is included for the described Old World species plus a brief synopsis of their distribution. The phylogenetic relationships are adduced for the world fauna. When geographic distribution is compared with the postulated family tree there are strong indications that the genus evolved primarily in Africa with an ancient dispersal to the Americas and more recent dispersals to the Oriental and Australian regions.

## INTRODUCTION

AMONG the most widespread and frequently the most abundant species of grassland leafhoppers are the moderately large tawny forms comprising the genus *Exitianus*, a member of the subfamily Deltocephalinae. This genus differs from related forms in having only a small number of apical, stout setae on the male pygofer; the female has a relatively long ovipositor extending conspicuously beyond the last dorsal segment. These characters are shared only by the presumably sister genus *Nephotettix*, readily differentiated from *Exitianus* by having the crown sharply ridged where it meets the face, and in being opaque green with various black markings.

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* This work was supported in part by a research grant from the National Science Foundation, U.S.A.

Based on similarities of male and female genitalia, *Exitianus* and *Nephotettix* are probably most closely related to *Doratura* and its allies; the entire complex can be segregated as a grass-feeding tribe, the Doraturini.

On every continent at least one common form of *Exitianus* has a conspicuous black band across the top of the head. So similarly coloured are these forms that considerable difference of opinion has existed concerning the number of species involved. The same difference has been expressed concerning the number of species occurring on the same continent. DeLong & Hershberger (1947) segregated eleven American species on the basis of colour and the number and position of the large pygofer spines. Linnavuori (1959) added a few more segregates from South America. No one appears to have undertaken a study of the Old World fauna of this genus. An opportunity in 1964 to examine types of the genus at the British Museum (Natural History) and Stockholm and to see large series of specimens from Africa, India, and Madagascar led me to attempt such a study. As new characters and species were found, the possibility became evident of reconstructing the phylogeny of the entire genus with a high degree of probability.

This paper treats the genus *Exitianus* in the following topical order: (1) a diagnosis and description of the world groups and the Eastern Hemisphere species, (2) a discussion of the peculiar problems encountered concerning species distinctions in the Eastern Hemisphere populations, (3) a derivation of the phylogeny of the genus, and (4) an application of these hypotheses to the question of its palaeodispersal.

This study is based entirely on the male sex. In several species, associated females are known but they have proven difficult to diagnose. Sexual dimorphism in colour is common, females of certain indubitably different species appear identical, and certain females that appear distinctive have as yet not been associated with males. In the face of these circumstances it appears that our present knowledge of *Exitianus* females does not lend itself to either keys or diagnoses of worthwhile predictive value.

## ***EXITIANUS*** Ball

*Exitianus* Ball, 1929 : 5. Type-species: *Cicadula obscurinervis* Stål.
*Mimodrylix* Zachvatkin, 1935 : 108. Type-species: *Athysanus capicola* Stål.

Body usually about 4–5 mm. long. Colour chiefly tawny with various patterns of brown or black. Head only moderately produced (Text-figs. 1–14), the crown rounding into the face. Wings elongate and having typical leafhopper venation. Male pygofer having from two to six large dark or black spines along apical margin and only one or two other conspicuous spines. Aedeagus having an articulation between shaft and base, the shaft relatively simple in structure. Female ovipositor extending a considerable distance beyond abdominal tergites.

Distribution. Recorded from all continents except Antarctica.

### KEY TO GROUPS AND OLD WORLD SPECIES—MALES

1 Plate short and ovoid, without lateral setae (Text-figs. 54, 55) ***okahandia*-group** 18
– Plate elongate-triangular, with a row of long, stout lateral setae extending the length of the plate (Text-fig. 78) . . . . . . . . . . 2

2 (1) Pygofer having four to six apical brown or black spines (Text-fig. 15) ***nanus*-group** 5

– Pygofer having two or three apical brown or black spines (Text-figs. 19, 21) . 3

3 (2) Dorsal margin of aedeagus with only a slight, irregular concavity at apex (Text-fig. 20) . . . . . . . . ***obscurinervis*-group** 6

– Dorsal margin of aedeagus with a large arcuate concavity at apex (Text-fig. 22) 4

4 (3) Spine 2 of pygofer as long and slender as spine 1 (Text-fig. 21) ***distanti*-group** 7

– Spine 2 of pygofer much shorter than and thicker than spine 1 (Text-fig. 24) ***taeniaticeps*-group** 8

### *NANUS*-GROUP

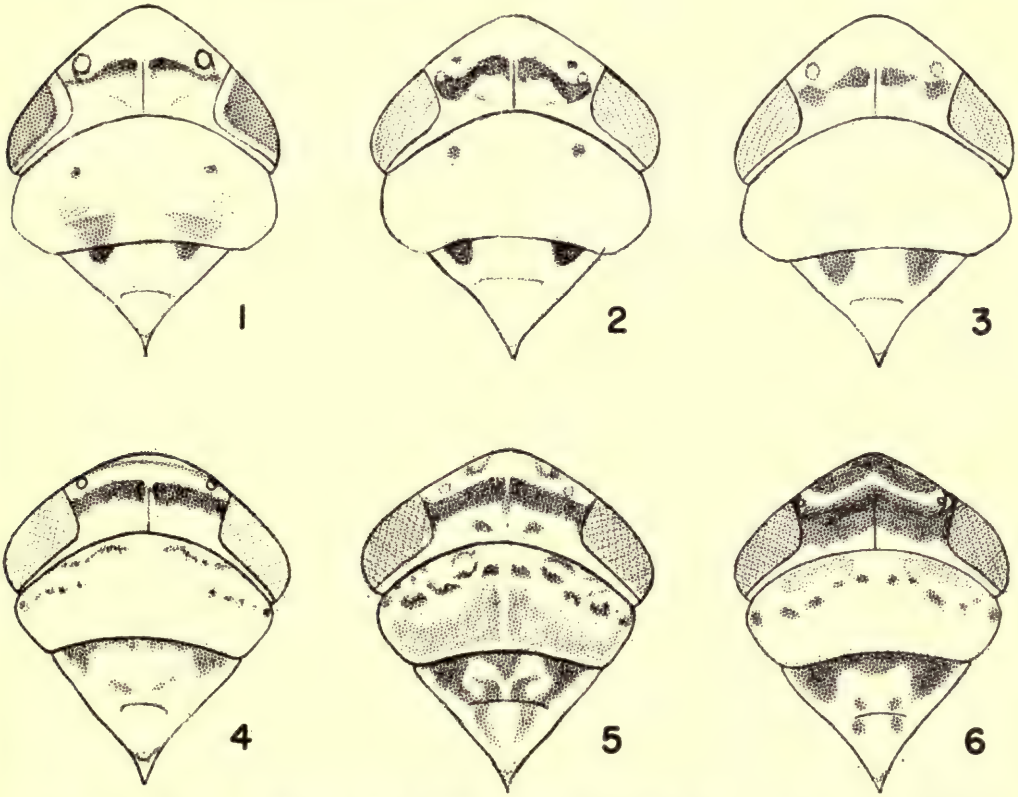
5 (2) Known only from one widespread Old World species . . . ***nanus*** (p. 7)

### *OBSCURINERVIS*-GROUP

6 (3) Known from several New World species not treated further here. For diagnostic treatments see DeLong & Hershberger (1947) and Linnavuori (1959).

### *DISTANTI*-GROUP

7 (4) Known only from one African species . . . . ***distanti*** (p. 8)



FIGS. 1–6. Head, pronotum and mesonotum of *Exitianus* spp. 1, *E. nanus* (India); 2, same, dark form (Okahandia, Rhodesia); 3, same, light form (Okahandia, Rhodesia); 4, *E. okahandia* (holotype); 5. *E. turneri* (holotype); 6, *E. natalensis* (holotype).

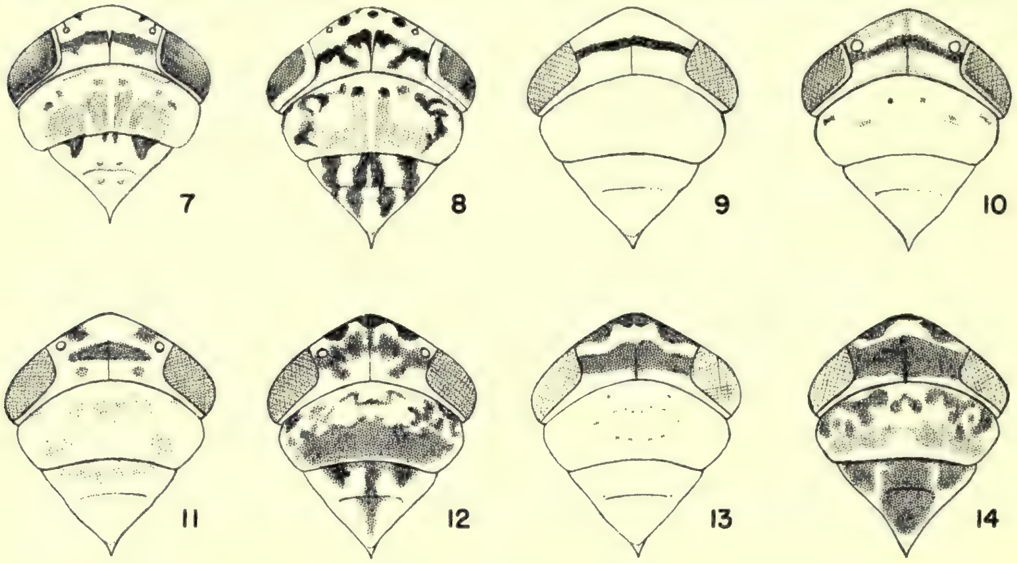
### *TAENIATICEPS*-Group

8 (4) Socket of spine 2 of pygofer almost contiguous with that of spine 1 (Text-fig. 23); head with extensive dark markings (Text-fig. 13) . ***kilimanus*** (p. 16)

– Socket of spine 2 a considerable distance from that of spine 1 (Text-fig. 24); head variously marked . . . . . . . . . . . . 9

9 (8) Spine 2 of pygofer only slightly asymmetrical (Text-figs. 64, 65); aedeagal shaft tapering almost uniformly from base to gonopore (Text-fig. 33) ***attenuatus*** (p. 10)

– Spine 2 of pygofer markedly twisted or bent at tip (Text-figs. 24, 26); aedeagal shaft either parallel-sided, or enlarged near gonopore, or markedly constricted at base of dorsal points . . . . . . . . 10



Figs. 7–14. Head, pronotum and mesonotum of *Exitianus* spp. 7, *E. picatus* (Mexico; 8, *E. exitiosus* (Illinois); 9, *E. indicus* ♀ (China); 10, *E. indicus* (holotype); 11, *E. coronatus* (holotype); 12, *E. ootacamundus* (holotype); 13, *E. kilimanus* (holotype); 14, *E. greensladei* (paratype).

10 (9) Shaft of aedeagus as thick as in Text-figs. 25, 28, 30, 31, its paired dorsal points usually well separated at base as in Text-fig. 27, its apex long, slender and markedly curved . . . . . . . . . . . 11

— Shaft of aedeagus thinner (Text-figs. 34–36, 39–51), or its dorsal points nearly contiguous at base . . . . . . . . . . . . 13

11 (10) Dorsum of head yellow with rigidly defined black spots as in Text-fig. 11 ***coronatus*** (p. 14)

— Dorsum of head otherwise (Text-figs. 10, 12) . . . . . . . 12

12 (11) Dark markings on top of head as extensive as in Text-fig. 12 ***ootacamundus*** (p. 14)

— Dark markings on top of head chiefly a single, arcuate, dark line (Text-fig. 10), sometimes with additional light brown suffusions . . ***indicus*** (p. 12)

13 (10) Dorsal profile of shaft with a slight notch on which dorsal points are situated (Text-figs. 34–36, 39–42, 47) . . . . . . . . . . . 14

— Dorsal profile of shaft with no indication of a notch where dorsal points are situated (Text-figs. 43–46, 48–51) . . . . . . . . . 16

14 (13) Profile of aedeagal shaft markedly angulate below gonopore, gonopore opening very long (Text-fig. 34) . . . . . . . . ***pondus*** (p. 11)

— Either profile of aedeagal shaft rounded below gonopore (Text-figs. 39–42) or gonopore opening much shorter (Text-figs. 35, 47) . . . . . . 15

15 (14) Either aedeagal shaft slightly to moderately flared before gonopore (Text-figs. 39–41) or dorsal points close to base of shaft (Text-fig. 42) ***taeniaticeps*** (p. 11)

— Aedeagal shaft not flared and dorsal points as far from base of shaft as shown in Text-figs. 35, 36, 47 . . . . . . . . . ***frontalis*** (p. 12)

16 (13) Head with extensive dark markings (Text-fig. 14) . . ***greensladei*** (p. 16)

— Head with only a dark arcuate band, as in Text-fig. 10 . . . . . 17

17 (16) Profile of aedeagal shaft with lateral ridge close to margin and apical excavation forming an obtuse angle with body of shaft (Text-figs. 48–51) ***plebeius*** (p. 15)

— Profile of aedeagal shaft with lateral ridge closer to central line of shaft and apical excavation forming nearly a right angle with body of shaft (Text-figs. 43–45) . . . . . . . . . . ***mucronatus*** (p. 14)

### *OKAHANDIA*-GROUP

18 (1) Apex of pygofer forming an upturned, fingerlike tip bearing one extremely stout, dorsally projecting spine and sometimes another much more slender spine (Text-figs. 60, 63); apex of style scarcely widened (Text-fig. 58) . . 19

— Apex of pygofer wider, not upturned, and bearing two fairly stout spines (Text-figs. 52, 56); apex of style greatly widened (Text-figs. 54, 55) . . 20

19 (18) Apex of pygofer bearing only one spine, this spine wider than pygofer tip (Text-fig. 63); profile of aedeagus wider (Text-fig. 62) . ***zuluensis*** (p. 18)

— Apex of pygofer bearing a slender seta mesad of large one, the latter narrower than pygofer tip (Text-fig. 60); profile of aedeagus narrower (Text-fig. 59) ***natalensis*** (p. 20)

20 (18) Style markedly shorter than plate (Text-fig. 55); costal area of front wing not forming a conspicuous light stripe . . . . . . ***okahandia*** (p. 17)

— Style projecting beyond plate (Text-fig. 54); costal area of front wing forming a conspicuous light stripe . . . . . . . ***turneri*** (p. 17)

## *NANUS*-GROUP

### ***Exitianus nanus*** (Distant) **comb. n.**

(Text-figs. 1, 2, 3, 15, 16, 17, 18, 76)

*Athysanus nanus* Distant, 1908 : 345. India.
*Athysanus insularis* Distant, 1909 : 47. Amirante Is. **syn. n.**
*Athysanus simillimus* Matsumura, 1914 : 185. Formosa. **syn. n.**
*Euscelis vulnerans* Bergevin, 1925 : 42. Southern Algeria. **syn. n.**

This is the most widespread Old World species of the genus, occurring throughout Africa, Asia Minor, southern Asia, Formosa, islands in the Indian Ocean, and Australia. The dorsal head markings may be faint or form dark spots or crescentic bars. Well-marked specimens show considerable geographic variation. In specimens from Asia, the dark markings usually form a solid curved arc interrupted on the meson (Text-fig. 1, as in the type of *nanus*); specimens from the southern half of Africa invariably have each half of the mark either narrowed in the middle (Text-fig. 2) or completely pinched off into a pair of black spots (Text-fig. 3). In specimens from Asia Minor and North Africa, the dark marks intergrade between the two darker types and occasionally these intergradations are encountered in Asian material also.

The type male of *insularis* (Text-fig. 15) has pygofer spines 2–4 relatively slender; males from Tanzania have them slightly shorter and more robust (Text-fig. 17); specimens from Johannesburg, Republic of South Africa, have a mixture of slender and stouter spines on each specimen, and sometimes five or six spines on a side (if so, usually not the same number on both sides). The spination of the pygofer therefore mirrors the variation found in the colour pattern.

I have studied the types of *nanus* Distant and *insularis* Distant but not those of *simillimus* Matsumura and *vulnerans* Bergevin. The latter two species I am placing on the basis of illustrations by Ishihara (1954, fig. 5) and illustrations in the original description, respectively.

The female seventh sternite is characterized by the bi-emarginate apical margin and the slightly bowed mesal area (Text-fig. 76).

## *OBSCURINERVIS*-GROUP

(Text-figs. 7, 8, 19, 20)

The members of this American group of species are remarkably homogeneous in shape of aedeagus and pygofer, and in spines 1 and 2 of the pygofer. In all members spine 3 is absent, in most members spine 4 is present, and in occasional individuals of the latter species an additional spine 5 may be present on one or both sides of the capsule. The females exhibit a considerable number of inter-specific differences in the shape of the apical margin of the seventh sternite.

DeLong & Hershberger (1947) and Linnavuori (1959) deal with eleven and seven American species, respectively. I am making no attempt to correlate the two accounts pending the availability of longer tropical series needed to establish the associations of the two sexes and possible synonymy.

## *DISTANTI*-GROUP

### ***Exitianus distanti* sp. n.**

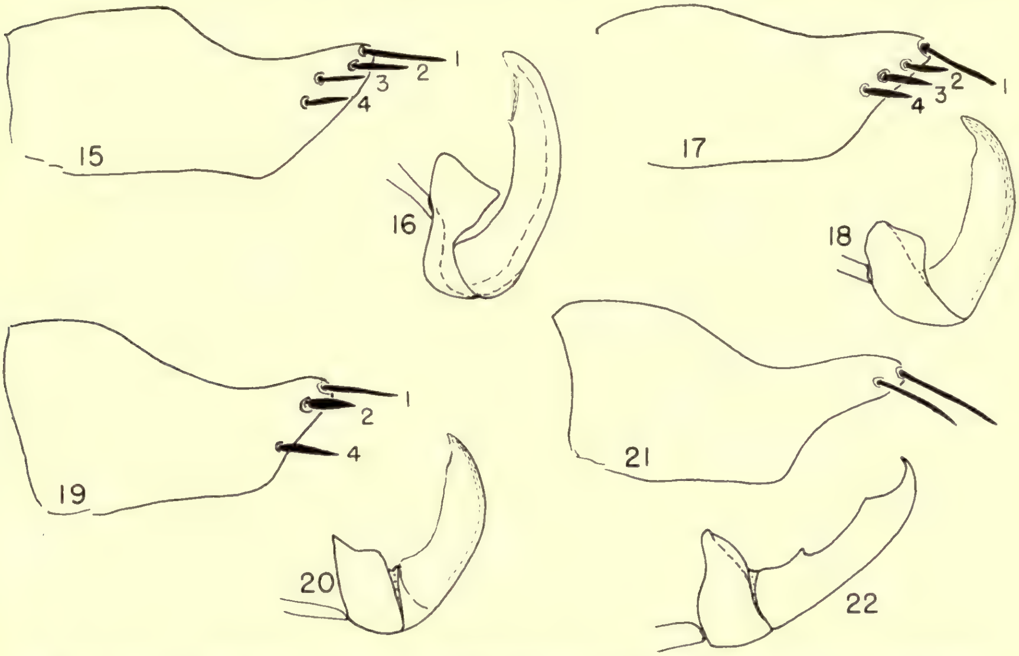
(Text-figs. 21, 22)

♂. Length 4 mm. Colour of dorsum pale greenish yellow, face the same but with arcuate dark lines, venter of thorax and abdomen almost black, legs with coxae black, the remaining segments tawny with dark streaks. Dorsum of head proportioned as in Text-fig. 9, without any trace of arcuate banding. General structure typical for genus. Pygofer having only setae 1 and 2, both of them straight and slender (Text-fig. 21). Aedeagus with shaft elongate, slender, its apex arcuately incised, as seen from lateral view, and the shaft bearing a pair of dorsal projections below middle (Text-fig. 22).

Holotype ♂ (in glycerine). [TANZANIA] Tanganyika: Ilonga, 28.vi.1962 (*L. Robertson*). In B.M.(N.H.).

Paratype. [Tanzania] Tanganyika: Ukirigiru, 1 ♂ (pinned, abdomen in glycerine), 27.iv.1961, light trap. In B.M.(N.H.).

The two specimens have been preserved in alcohol, and the greenish cast may be due to the action of that preservative. This species forms a unique group all of its own, characterized by the possession of only spines 1 and 2 on the pygofer, and the long and slender spine 2 that is much like spine 1. In all other known species having only spines 1 and 2, spine 2 is much thicker and more densely pigmented than spine 1.

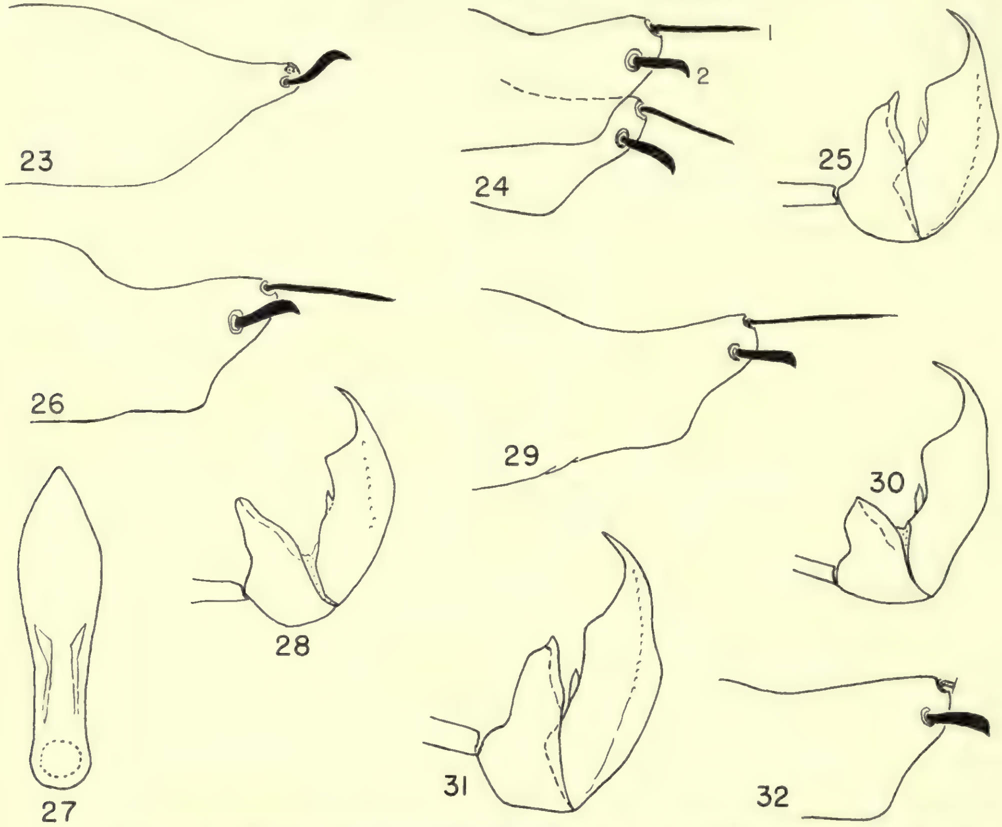


Figs. 15–22. Male genital parts of *Exitianus* spp. 15, 16, *E. nanus* (holotype of *insularis*); 17, 18, *E. nanus* (Tanzania); 19, 20, *E. exitiosus* (Illinois); 21, 22, *E. distanti* (holotype); 15, 17, 19, 21, pygofer; 16, 18, 20, 22, aedeagus, lateral aspect.

## *TAENIATICEPS*-Group

In this group the aedeagus has a well-defined preapical notch, a sharp, curved apex, and a pair of small, dorsal, sclerotized points; the pygofer usually possesses only spines 1 and 2, of which spine 1 is slender and elongate, and spine 2 is much shorter, black, and more or less twisted at the tip (Text-figs. 23, 24, 64, 65). In most species the vertex of the head has only a single transverse-arcuate black band (Text-fig. 9), often with suffusions of paler brown (Text-fig. 10); in a few the vertex is darker (Text-fig. 12) or has a different pattern of banding (Text-fig. 11).

In those species for which the two sexes are associated (*indicus*, *taeniaticeps*, *frontalis*, and *plebeius*), the female eighth sternite has a narrow, V-shaped apical incision bordered with darker colouring (Text-fig. 69). In the case of *mucronatus*, *pondus*, and several other species, females of the same type were present from the same or nearby localities. It seems likely that females of all members of this group share this distinctive configuration of the eighth sternite. The unassociated female type of *capicola* (Stål) (Text-fig. 70) can therefore at present be assigned to this group but not definitely to any species. As explained below under *indicus* Distant, geographic location gives a clue as to the possible identity of *fusconervosus* (Mots.).



FIGS. 23–32. Male genital parts of *Exitianus* spp. 23, *E. kilimanus* (holotype); 24, 25, *E. ootacamundus* (holotype); 26, 27, 28, *E. indicus* (type series); 29, 30, *E. indicus* (Ceylon); 31, 32, *E. coronatus* (holotype). 23, 24, 26, 29, 32, pygofer; 25, 28, 30, 31, aedeagus, lateral aspect; 27, aedeagus, posteroventral aspect.

## *Exitianus attenuatus* sp. n.

(Text-figs. 33, 64, 65, 66)

♂. Length 4·5 mm. Colour above and below tawny, with a thin arcuate black line across dorsum of head (as in Text-fig. 9) and frontal area of head and legs with small dark markings. General structure typical for genus. Pygofer with spines 1 and 2, or 1, 2 and 3; spine 1 is long and slender, spine 2 or spines 2 and 3 are shorter, thicker, darker and very slightly asymmetrical at apex (Text-figs. 64, 65). Aedeagus with shaft tapering almost uniformly from base to gonopore, the portion beyond that slender and arcuately incised (Text-fig. 33); near the base of the shaft are a pair of dorsal points or projections that are finger-like, flared laterally, the two well separated at the base (Text-fig. 66).

Holotype ♂ (pinned, genitalia in glycerine). SOUTH AFRICA: Cape Province, Somerset East, xi.1930 (*R. E. Turner*). In B.M.(N.H.).

Paratype. Same data, 1 ♂ (pinned, genitalia in glycerine). In B.M.(N.H.).

Both type specimens have the pygofer spines somewhat damaged, but the remaining evidence indicates several interesting items: (1) spine 1 is long and slender; (2) spine 2 is only slightly asymmetrical (Text-figs. 64, 65), not approaching the bent condition (Text-figs. 23, 24, 26) of related species; and (3) the genetic control for spine 3 has not been completely lost. The latter two points warrant a serious consideration of this species as the most primitive of its group.

### ***Exitianus pondus*** **sp. n.**

(Text-figs. 34, 67)

♂. Length 5 mm. Colour tawny except for a fine dark arcuate line across anterior portion of vertex and a few dark marks on the face and legs. General structure typical for genus. Pygofer with spines 1 and 2 only, spine 1 long and slender, spine 2 deeper, shorter, almost jet black, and markedly asymmetrical (Text-fig. 67), the extreme tip slightly but definitely hooked ventrally. Aedeagus (Text-fig. 34) with profile of shaft wide at base and tapering slightly to gonopore, the apex with an arcuate incision occupying the apical third of the shaft and forming a long narrow apex sharply hooked at tip; near the base of the shaft is a prominent pair of dorsal points.

Holotype ♂ (pinned, abdomen in glycerine). S. AFRICA: Pondoland, Port St. John, 1–9.vii.1923 (*R. E. Turner*). In B.M.(N.H.).

Paratypes. Same data, 2 ♂. In B.M.(N.H.).

Three specimens that resemble the above types very closely but lack dorsal points at the base of the shaft are tentatively considered as this species but not included in the types, as follows: S. AFRICA: Zululand, Gingindhlovu, 2 ♂, 15.vi.1926 (*R. E. Turner*); MADAGASCAR: Morondova, forest south of Befasy, 1 ♂, i.1956 (*R.P.*).

### ***Exitianus taeniaticeps*** (Kirchbaum)

(Text-figs. 37, 39–42, 71)

*Athysanus taeniaticeps* Kirchbaum, 1868 : 87. Messina, Syracuse.

I have not seen the type of this species, but the description fits perfectly the species here considered as *taeniaticeps*, which is the only species of the group so far identified from the circum-Mediterranean countries. Specimens from Iraq, Lebanon, Cyprus, France, and Libya are remarkably uniform, in contrast with other populations in the species, in having the dorsal points some distance from the base of the shaft (Text-figs. 39–41). Males from Rhodesia, considered as this species, usually have these points almost at the base of the shaft (Text-fig. 42). Large series of males from central Sudan are much more variable in this character, completely bridging the morphological gap between the Mediterranean and Rhodesian populations.

This situation suggests that the Mediterranean and South African populations represent previously isolated segments of an ancestral population that became morphologically different, then were brought together by changing ecological conditions and have since formed an intermingled, freely-hybridizing population in at least the Sudan.

In a few Rhodesian males the apico-central corner of the pygofer is almost square (Text-fig. 37), in contrast to the sinuate condition normally found throughout other populations of the species (as indicated by the broken line in Text-fig. 37).

The illustrations of Ribaut (1952 : 138, figs. 245–249) undoubtedly refer to this species, although pygofer spine 2 is shown as straight rather than contorted at the tip. It should be noted that in Fig. 248 the shaft is folded into the socket so that the latter hides the real base of the shaft and the dorsal points of the shaft therefore erroneously appear to be basal.

### ***Exitianus frontalis*** (Distant) **comb. n.**

(Text-figs. 35, 36, 47)

*Athysanus frontalis* Distant, 1917 : 317. Seychelles.

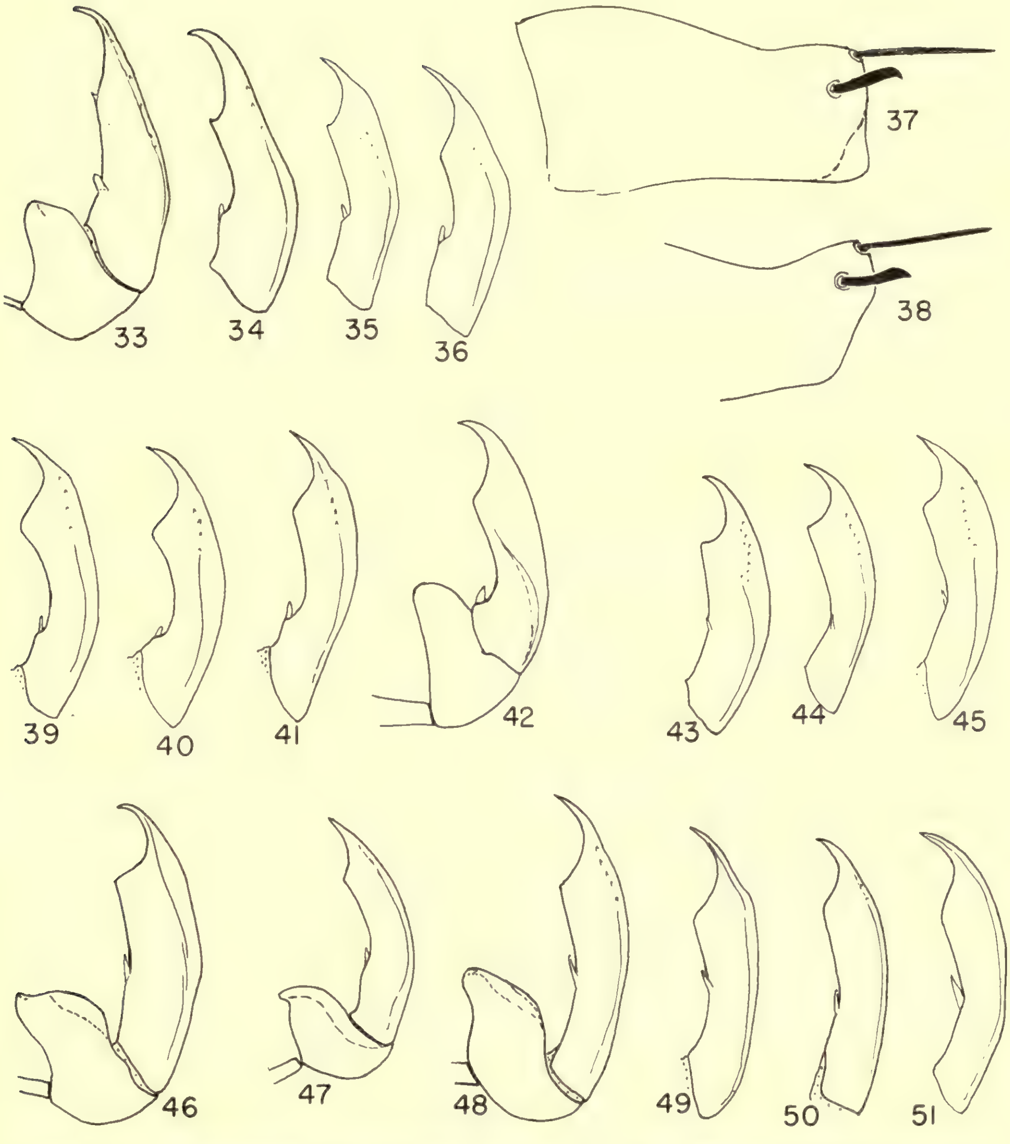
An extremely close relative of *taeniaticeps*, this species as here recognized is diagnosed by the uniformly thick shaft (Text-figs. 35, 36) in contrast with the slightly to markedly clavate shaft of *taeniaticeps* (Text-figs. 39–42). In *frontalis* the dorsal points of the shaft are some distance from the shaft's base, as sometimes occurs in Mediterranean specimens but not in South African specimens of *taeniaticeps*, suggesting that in the latter species there has been a displacement of this character in the southern part of Africa where both *taeniaticeps* and *frontalis* occur in the same area.

To date this species has been found in the Seychelles, Madagascar (Diego-Suarez, Montagne des Francais), and South Africa (Pondoland). It is interesting that the three specimens from Pondoland exhibit almost exactly the same range of variation in the aedeagal shaft as found in the two specimens illustrated from Madagascar. The male from the type series (Text-fig. 47) is a slender extreme, matched almost perfectly by a specimen from Pondoland in the Turner collection, B.M.(N.H.). I have studied the female type, in which the eighth sternite is notched as in other species of the group.

### ***Exitianus indicus*** (Distant) **comb. n.**

(Text-figs. 9, 10, 26–30, 69)

?*Athysanus fusconervosus* Motschulsky, 1863 : 97. Ceylon.
*Athysanus indicus* Distant, 1908 : 344. India.
*Athysanus atkinsoni* Distant, 1908 : 345. India. **syn. n.**



FIGS. 33–51. Male genital parts of *Exitianus* spp. 33, *E. attenuatus* (holotype); 34, *E. pondus* (holotype); 35, 36, *E. frontalis* (Madagascar); 37, *E. taeniaticeps* (Rhodesia); 38, *E. frontalis* (type series); 39, 40, 41, *E. taeniaticeps* (Tripoli); 42, the same (Rhodesia); 43, 44, 45, *E. mucronatus* (holotype and two paratypes, respectively); 46, *E. greensladei* (holotype); 47, *E. frontalis* (type lot); 48, *E. plebeius* (Queensland); 49, the same (paratype of *plebeius*); 50, the same (Samoan Is.); 51, the same (homeotype of *norrisi*). 37, 38, pygofer; all others, aedeagus or shaft only, lateral aspect.

This is a pale species having a faint or thin, dark, transverse, arcuate band on the vertex. It has been taken at several localities in India (in great abundance at Kharagpur), Ceylon, Formosa, and Japan.

I have studied the female types of both Distant names. These are in B.M.(N.H.), bearing identical data 'Calcutta, Atkinson Col. 92.6.' The common type series of the two species contains several males that demonstrate the characters of this sex (Text-figs. 26–28).

There is a possibility that *fusconervosus* Motschulsky, described from the summit of Mt. Patannos, Ceylon, may apply to this species, which is the only one of the genus thus far recorded for the island, but the unavailability of the type mitigates against the use of its carrier name at the present time. Ishihara's illustrations of *E. capicola* (Stål), listed under *Mimodrylix* Zakhvatkin, undoubtedly apply to this species (Ishihara, 1954 : 6).

### ***Exitianus coronatus*** (Distant) **comb. n.**

(Text-figs. 11, 31, 32)

*Phrynomorphus coronatus* Distant, 1918 : 52. India.

This species is remarkably like *indicus* in morphological details of the male genitalia (Text-figs. 31, 32) but differs markedly in the dorsal spotted pattern of the head (Text-fig. 11).

The species is known only from the type, which I have studied. It is in B.M. (N.H.) and was collected at Kumaon, N.W. India.

### ***Exitianus ootacamundus*** (Distant) **comb. n.**

(Text-figs. 12, 24, 25)

*Phrynomorphus ootacamundus* Distant, 1918 : 51. India.

As is true for the above-mentioned species, this one also is practically identical in details of male genitalia (Text-figs. 24, 25) with *indicus*, differing primarily in having a much darker head (Text-fig. 12).

To date the only known record is the type, which I have studied. It is in B.M. (N.H.) and was collected at Ootacamund, South India.

### ***Exitianus mucronatus*** **sp. n.**

(Text-figs. 43, 44, 45)

♂. Length 4·5 mm. Colour pale tawny except for a black arcuate band across the vertex, much as in Text-fig. 9, and a few pale marks on face and legs. General structure typical for genus. Pygofer with spines 1 and 2 only, spine 1 very long slender, spine 2 much shorter, asymmetrical, and slightly hooked at apex as in Text-fig. 37. Aedeagus with shaft moderately long and thick (Text-figs. 43–45), with an apical arcuate incision resulting in a sharp hooked tip; the dorsal points are minute and their bases do not interrupt the even contour of the dorsal surface.

Holotype ♂ (pinned, abdomen in glycerine). MADAGASCAR: Ft. Dauphin (*R.P.*). In collection of Madagascar Scientific Institute.

Paratypes. MADAGASCAR: Ft. Dauphin, Tananarive, Bas Mangoky, Nosivola, Perinet, Monronova forest south of Befasy, Montagne des Francais and Andova, 28 ♂. In collections of Madagascar Scientific Institute, Illinois Natural History Survey and B.M.(N.H.).

This series of specimens appears to represent a distinctive and perhaps an endemic Madagascar species differing from *plebeius* in having a stouter aedeagal shaft whose ventral lateral ridges curve dorsally and disappear toward the apex. In Madagascar, *mucronatus* appears to displace *taeniaticeps* almost completely, although the latter species appears to be abundant in Madagascar at Mohali, lac Iconi, and one specimen has been taken from Rte de Fianarantsoa, Km. 334. These specimens of *taeniaticeps* are like the more massive Rhodesian type rather than the narrower type found around the Mediterranean.

### ***Exitianus plebeius*** (Kirkaldy) **sp. rev., comb. n.**

(Text-figs. 48–51, 68)

*Nephotettix plebeius* Kirkaldy, 1906 : 331. Queensland.
*Eutettix norrisi* Evans, 1938 : 14. West Australia. **syn. n.**
*Euscelis transversus* Metcalf, 1946 : 122. Guam. **syn. n.**

This species has the same tawny colour and black arcuate stripe on the vertex as is found in *indicus* and several other species of the genus (as in Text-fig. 9). It is most closely related to *frontalis*, from which it differs in lacking a notch on the dorsal profile of the shaft where the dorsal spines arise (Text-figs. 48–51), and to *E. mucronatus*, from which it differs in the longer and more slender aedeagal shaft.

The holotype ♀ and paratype ♂, which I have examined, are from Cairns, Queensland, Australia, deposited in the Bernice P. Bishop Museum, Honolulu. Both appear to be the same species and I am herewith designating the ♂ paratype as the allotype. I have also examined the ♂ holotype of *transversus*, which agrees exactly with males from Australia.

Concerning *norrisi*, I am following the synonymy of Evans (1966). To date the only records of this species I have personally examined are from Australia, Guam, and Samoa. The records of *capicola* cited by Linnavuori (1960) from Fiji are based on females, but probably refer to this species. Previously this species has been confused with other species in the Old World having the same colour, and the Australian records have been labelled as *capicola*. The distinct, long shaft and the inconspicuous dorsal aedeagal spines indicate, however, that this species is different from those occurring on other continents.

## ***Exitianus greensladei* sp. n.**

(Text-figs. 14, 46, 78)

♂. Length 4 mm. Background colour tawny with many dark areas; vertex with a wide black arcuate band covering most of the area, face almost entirely black, the facial marks running up slightly over the edge of the vertex; exposed thorax with heavy black spots (Text-fig. 14); legs and venter of body with irregular dark marks; membrane of wings almost hyaline, the veins bordered by dark brown striping. General structure typical for genus. Pygofer with only spines 1 and 2, spine 1 long and slender, spine 2 shorter, thicker, darker, and slightly hooked at apex, as in Text-fig. 24. Aedeagus with shaft long and slender (Text-fig. 46), the dorsal points minute and their bases below the dorsal contours.

Holotype ♂ (pinned, abdomen in glycerine). SOLOMON ISLANDS: Guadalcanal, Kau Kau, 17.xi.1962, no. 2924 (*P. Greenslade*). In B.M.(N.H.).

Paratype. Same data, 1 ♂ (pinned, abdomen not cleared). In B.M.(N.H.).

This heavily marked species is a close relative of *plebeius*, which it resembles in structure of genitalia and from which it differs primarily in the dark colour pattern. The two specimens of the type series are both markedly smaller (4 versus 5 mm.) than any specimens of *plebeius* I have yet seen.

## ***Exitianus kilimanus*(Jacobi) comb. n.**

(Text-figs. 13, 23)

*Phrynomorphus kilimanus* Jacobi, 1910 : 131. Kilimandjaro, Africa.

This species is readily distinguished by the twisted spine 2 of the pygofer and the very close proximity of the bases of spines 1 and 2 (Text-fig. 23). The head and pronotum are heavily marked with black (Text-fig. 13), much as in *greensladei*. The type ♂ (which I have seen) bears the collection data: Meru, 3,000–3,500 m Jan. (*Sjostedt*). Another female from the same locality on Mount Kilimandjaro bears a type label but a second female bearing a red 'Allotypus' label is evidently another species. I was not in the Stockholm Museum long enough to clear the genitalia of the type but the diagnostic position of the pygofer spines was readily visible on the dried specimen.

### *OKAHANDIA*-GROUP

Among the extensive grass-inhabiting species collected in Africa by R. E. Turner, I found four species that form a distinctive group of *Exitianus* in which the plates are short and lack lateral spines, and the styles have the apex truncate and projecting nearly posteriorly, rather than being sharp and curved sharply laterally (Text-fig. 82) as is true of all other members of the genus.

### ***Exitianus okahandia*** **sp. n.**

(Text-figs. 4, 55, 56, 57, 72)

♂. Length 4 mm. Colour tawny with the following black marks: a fairly narrow arcuate band on vertex, small black spots on pronotum, several black spots on scutellum (Text-fig. 4), plus markings on the face, legs, and venter. General structure typical for genus. Plates ovate, without lateral spines, and about as long as wide (Text-fig. 55), extending considerably beyond apex of styles. Styles with apex broadened and truncate (Text-fig. 55). Pygofer of usual shape for genus, with only spines 1 and 2, both symmetrical, spine 2 shorter, thicker, and darker than spine 1 (Text-fig. 56). Aedeagus moderately long, its apex with only a slight and inconspicuous incision (Text-fig. 57).

♀. Length 5·5 mm. Colour and general structure similar to male. Apex of eighth sternite slightly produced in middle, the segment often with a small dark spot on each side near the middle of the lateral half of the segment (Text-fig. 72).

Holotype ♂ (pinned, abdomen in glycerine). SOUTH AFRICA: Natal, Van Reenen, Drakensberg, 1–22.i.1927 (*R. E. Turner*). In B.M.(N.H.).

Allotype ♀. SOUTHWEST AFRICA: Okahandja, 10–16.ii.1928 (*R. E. Turner*). In B.M.(N.H.).

Paratypes. Same data as allotype ♀, 3 ♂, 8 ♀, with inclusive dates 27.i–18.iii. 1 ♂, 1 ♀ in Illinois Natural History Survey collection, remainder in B.M.(N.H.).

Additional females that appear to belong to this species are from SOUTH AFRICA: Cape Province, Queenstown; Transkei, Untata. [TANZANIA] Tanganyika: Ukiriguru.

### ***Exitianus turneri*** **sp. n.**

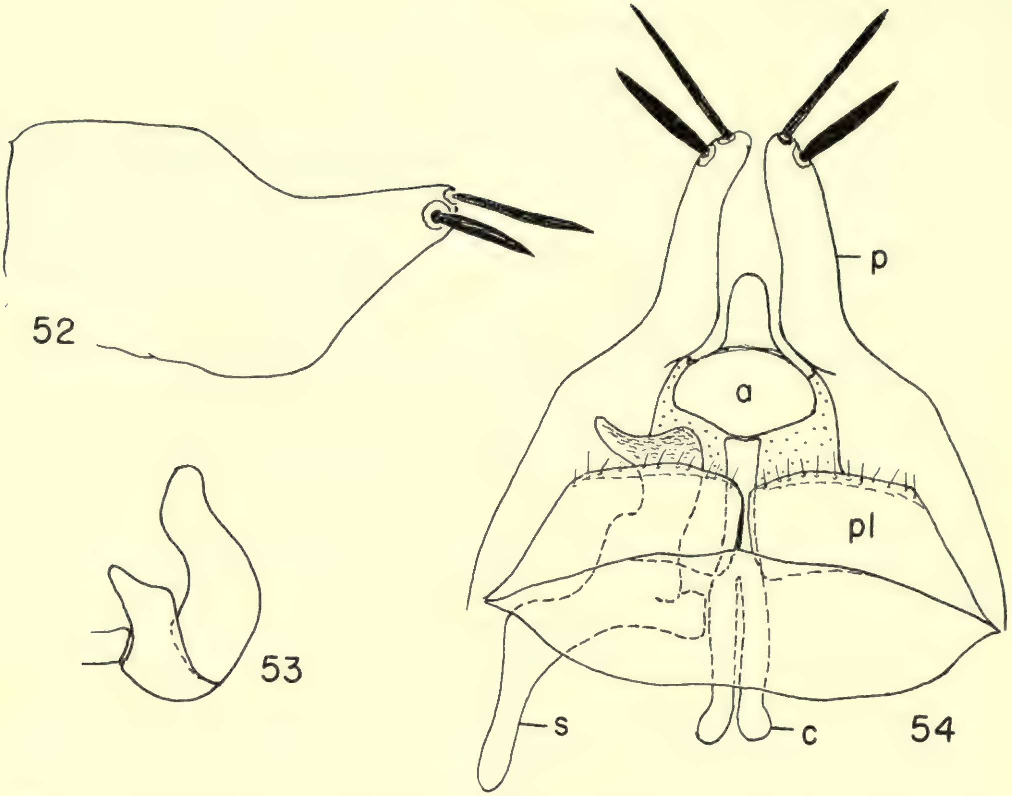
(Text-figs. 5, 52, 53, 54, 73)

♂. Length 4·5 mm. Colour tawny, head with a black arcuate band slightly interrupted at middle (Text-fig. 5), face with a narrow mesal stripe in addition to more lateral markings; legs with dark marks; tegmina with all veins pale brown except costal margin which is contrastingly cream coloured. General structure typical for genus. Pygofer moderately narrow at apex, which bears spines 1 and 2, both long and symmetrical, spine 2 thicker and shorter than spine 1 and with a marked crease at its base (Text-fig. 52). Plates short and obliquely truncate, without large lateral spines (Text-fig. 54). Style with flared apex, extending slightly beyond plate (Text-fig. 54). Aedeagus with shaft short and slightly sinuate (Text-fig. 53).

♀. Length 5·5 mm. Colour and general structure similar to male except for the median stripe on the face which is usually paler. Eighth sternite (Text-fig. 73) with a fairly deep broad cleft apically, and with a black oblique bar on each side almost at the apical margin.

Holotype ♂ (pinned, abdomen in glycerine). SOUTH AFRICA: Pondoland, Port St. John, 1–11.vi.1923 (*R. E. Turner*). In B.M.(N.H.).

Allotype ♀. SOUTH AFRICA: Zululand, Gingindhlovu, 15.vi.1926 (*R. E. Turner*). In B.M.(N.H.).



Figs. 52–54. Male genitalia of *Exitianus turneri*. 52, pygofer; 53, aedeagus, lateral aspect; 54, genital assemblage, ventral aspect (one style omitted). *a*, aedeagus; *c*, connective; *p*, pygofer; *pl*, plate; *s*, style.

Paratypes. Same data as allotype, 3 ♂ (one without abdomen), 4 ♀, with inclusive dates 9.vi–5.vii.1926; Natal, Kloof, 1500 ft., 1 ♀, viii.1926 (*R. E. Turner*). In B.M.(N.H.), one pair in Illinois Natural History Survey collection.

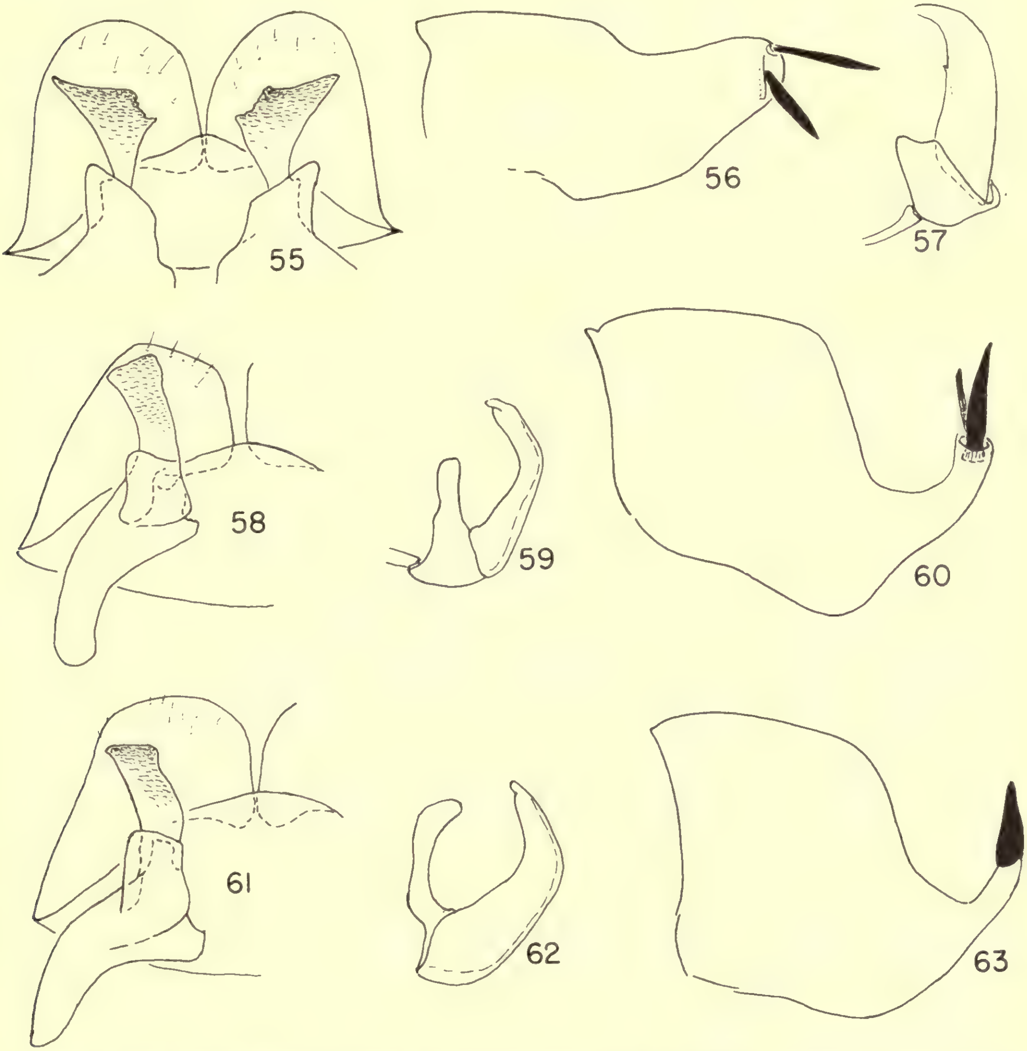
This species differs from the preceding in the shorter plates and other details of the genitalia, and in the contrasting pale costal margin of the tegmina. In this latter character it resembles the following species, from which it differs in details of the male genitalia and the female eighth sternite.

### ***Exitianus zuluensis* sp. n.**

(Text-figs. 61, 62, 63, 74)

♂. Length 5 mm. Colour tawny, the head with an arcuate black band on vertex, and almost equally dark median stripe on the face. Lateral areas of face and legs with dark markings. Tegmina with all veins brown except the costal margin which is cream colour. General structure typical for genus. Pygofer (Text-fig. 63) with apical half strongly narrowed and upturned, ending in a single, dorsally-directed heavy black spine (presumably number 2). Plates short, broadly rounded at apex, and without large lateral setae (Text-fig. 61). Style with apex obliquely truncate, only moderately wide, extending almost to the apex of the plate (Text-fig. 61). Aedeagus with shaft relatively small, slightly angulate near middle, and narrowed at extreme tip (Text-fig. 62).

♀. Length 5·5 mm. Colour and general structure same as male. Eighth segment with transverse posterior margin and with a pair of dark areas, one on each side, just in front of posterior margin (Text-fig. 74).



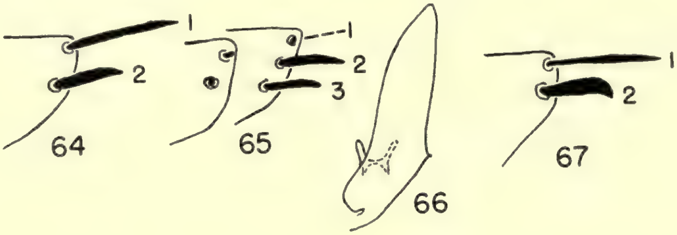
FIGS. 55–63. Male genital parts of *Exitianus* spp. 55, 56, 57, *E. okahandia* (holotype); 58, 59, 60, *E. natalensis* (holotype); 61, 62, 63, *E. zuluensis* (holotype). 55, 58, 61, style, ventral aspect, with outline of plate shown beneath; 56, 60, 63, pygofer; 57, 59, 62, aedeagus, lateral aspect.

Holotype ♂ (pinned, abdomen in glycerine). SOUTH AFRICA: Zululand, Eshowe, vi.1926 (*R. E. Turner*). In B.M.(N.H.).

Allotype ♀. Same data as holotype. In B.M.(N.H.).

Paratypes. Same data as holotype, 3 ♀, 3 without abdomens, with inclusive dates, vi–vii. In B.M.(N.H.), 1 ♀ in Illinois State Natural History Survey collection.

This species is readily distinguished from the preceding by the peculiar upturned pygofer, and from the species that follows by its pale colour pattern.



FIGS. 64–67. Male genital parts of *Exitianus* spp. 64, *E. attenuatus* (holotype), apex of right side of pygofer; 65, same (paratype), apex of right and left sides of pygofer, respectively; 66, same (paratype), quartering posterior view of aedeagal shaft; 67, *E. pondus* (holotype), apex of pygofer.

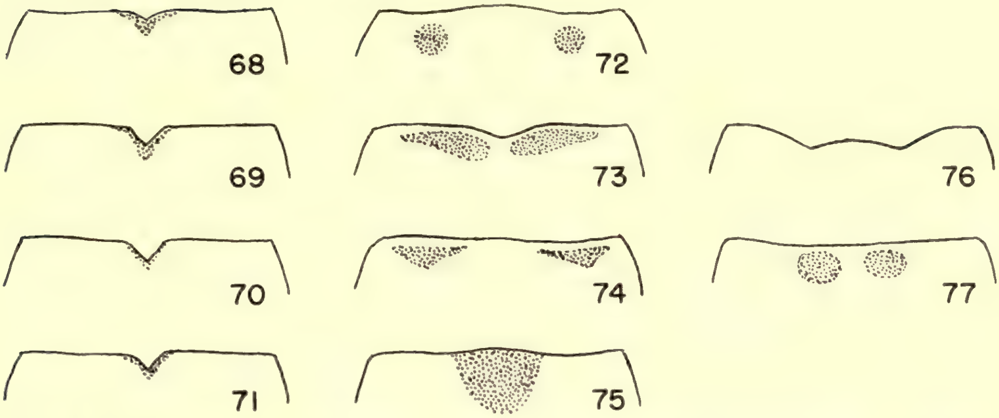
## ***Exitianus natalensis* sp. n.**

(Text-figs. 6, 58, 59, 60, 75)

♂. Length 4·5 mm. Base colour of dorsum chiefly tawny, vertex of head (Text-fig. 6) with a very wide black arcuate band, pronotum with lateral dark marks, mesonotum with lateral black triangles, face mostly black with tawny enclosed areas, the facial marks running up onto vertex; venter and legs mostly black; tegmina with veins brown and costa contrastingly cream coloured. General structure typical for genus. Pygofer (Text-fig. 60) with apical half strongly narrowed and upturned, the tip bearing spines 1 and 2, their bases contiguous, spine 1 very slender, shorter than 2, spine 2 long and massive. Plates fairly short, and apex broadly rounded, the lateral margin without large setae (Text-fig. 58). Style with relatively long apex, which is truncate and which almost reaches the margin of the plates (Text-fig. 58). Aedeagus with shaft relatively small, curved near middle, and narrowed at extreme tip (Text-fig. 59).

Holotype ♂ (pinned, abdomen in glycerine). SOUTH AFRICA: Natal, Van Reenen, Drakensberg, 1–22.i.1927 (*R. E. Turner*). In B.M.(N.H.).

Three females from Pondoland, Port St. John (B.M.(N.H.)), may belong to this species. In general colour pattern they resemble the male closely, but the pronotum and mesonotum are both much darker and therefore there is a possibility that they may represent another undescribed species. The eighth sternite has the apical margin transverse and uniformly dark coloured (Text-fig. 75).



FIGS. 68–77. Apex of female eighth sternite. 68, *E. plebeius* (holotype); 69, *E. indicus* (holotype); 70, *E. capicola* (holotype); 71, *E. taeniaticeps* (Libya); 72, *E. okahandia* (allotype); 73, *E. turneri* (allotype); 74, *E. zuluensis* (allotype); 75, *E. natalensis* (Pondoland); 76, *E. nanus* (holotype); 77, *E. africanus* (holotype).

## UNPLACED SPECIES

*Bythoscopus africanus* Walker, 1851 : 873. Type ♀ seen in B.M.(N.H.), from Sierra Leone (*Morgan*), 42, 31. The banded head (much as in Text-fig. 10) and the elongate ovipositor indicate that this species is a member of *Exitianus*, but the eighth sternite has a straight posterior margin and a pair of large posterior dark spots (Text-fig. 77). No males have been associated with this distinctive specimen, apparently representing a valid species.

*Athysanus capicola* Stål, 1855 : 99. Type ♀ seen in the Stockholm Museum, from Meru, Neider. This is a typical member of the *taeniaticeps* group, with head banded much as in Text-figure 9 and the eighth sternite with a median notch (Text-fig. 70). At present it is impossible to associate this specimen with a recognized species.

*Eutettix pallida* Evans and *selbyi* Evans, 1938 : 14. Both of these species were described from ♀ types collected in Queensland, and might prove to be additional junior synonyms of *plebeius*. The leafhopper fauna of Australia is as yet not well enough collected to make undue assumptions concerning the identity of females in this group of species.

## SPECIES TRANSFERRED TO OTHER GENERA

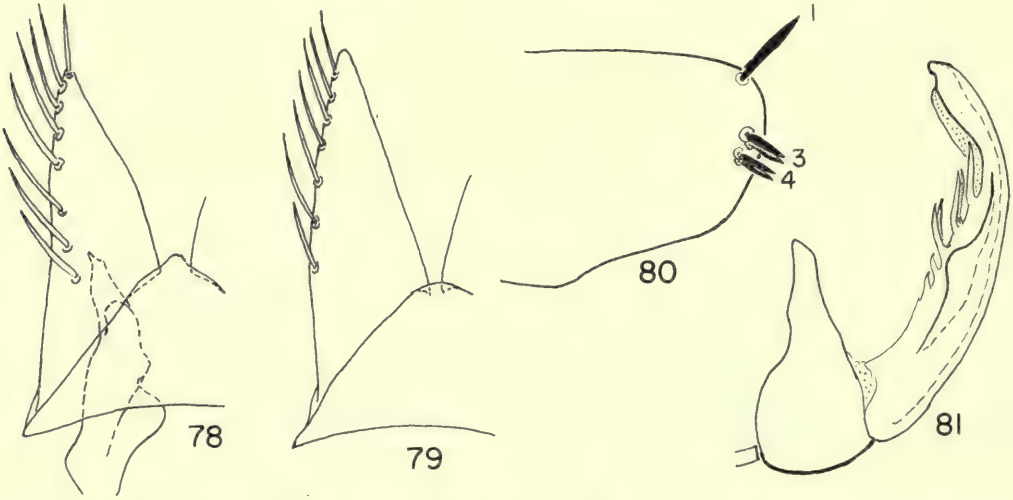
Two species placed in *Exitianus* by Evans (1966) do not belong in this genus—*Nephotettix contemptus* Kirkaldy (1906) and *Nephotettix eurytus* Kirkaldy (1907), both described from Sydney, N.S.W., Australia. I have examined the ♀ holotypes and an associated ♂ of *contemptus*; they appear to belong to *Hybrasil* Kirkaldy (1907 : 41) with *brani* Kirkaldy as type-species. I have not examined the type of the latter, but the Australian specimens mentioned agree in all but details of individual parts with Linnavuori's (1960) illustrations and description of *brani*.

The types of Kirkaldy's two Australian species appear identical. The description of *Carvaka fulvida* Evans (1966), described from the Bunya Mountains, Queensland, Australia, is highly suggestive of the same species. The following synonymy is therefore offered:

### ***Hybrasil contemptus*** (Kirkaldy) **comb. n.**

*Nephotettix contemptus* Kirkaldy, 1906 : 332.
*Nephotettix eurytus* Kirkaldy, 1907 : 54. **syn. n.**
*?Carvaka fulvida* Evans, 1966 : 244. **comb. n.**

The taxonomic position of *Hybrasil* is uncertain. Linnavuori (1960) placed it in the Drabescinae and Evans (1966) his *C. fulvida* in the Selenocephalini (Cicadellinae). Salient features of the genus include the following: Clypellus constricted in middle and expanded at apex; front margin of head with a yellow band defined above and below by a low but sharp carina, and extending from eye to eye; venation typical but with apical two costal crossveins edged with black (as in *Fieberiella*); plate elongate, the apex narrow and partly membranous, and without large lateral setae; aedeagus with shaft articulated with socket; and ovipositor extending well beyond pygofer (as in *Exitianus*). Characters of the aedeagal shaft and ovipositor suggest an affinity with the Doraturini.



FIGS. 78–81. Male genital parts of leafhoppers. 78, *Exitianus greensladei* (holotype); 79, 80, 81, *Nephotettix apicalis* (India). 78, 79, plate, ventral aspect; 80, pygofer; 81, aedeagus, lateral aspect.

## PROBLEMS OF SPECIES RECOGNITION

On the basis of material that has been examined in this study, there is little problem in establishing satisfactory species-limits in the *nanus*-group (only one species), the *distanti*-group (only one species), and the *okahandia*-group (four species).

In the *obscurinervis* and *taeniaticeps*-groups, however, the situation is far from clear.

## *OBSCURINERVIS*-Group

DeLong & Hershberger (1947) recognized eleven American species, using the number and juxtaposition of the pygofer spines as their primary bases of species separation, supplemented with colour differences. Linnavuori (1959) uses the same sequence of characters in keying the seven species he recognized from the neotropical region. Oman (1949) questions the value of the number of the pygofer spines as diagnostic characters. He points out that it is not uncommon to find a specimen having unequal numbers of these spines on the left and right sides of the pygofer; I have observed this same phenomenon. It is possible, however, that in some species the relative position of the spines (if present) may represent diagnostic characters.

The real crux of whether or not different entities should be considered as distinct species is whether or not each unit forms a continuing series of populations progressing through time and evolving independently of other genetic lineages (Simpson, 1951; Ross, 1962). This is a theoretical concept that can be tested experimentally by crossbreeding if adequate material is available and techniques are known. With *Exitianus* this experimental avenue is not yet available. The only other highly reliable criterion of the evolutionary distinctness of bisexual phylogenetic lines is whether or not the species segregates occur in the same area, yet remain distinct, with little or no indication of hybridization. In a number of collections of American *Exitianus*, I have found excellent evidence of different pairs of species occurring together with no sign of intergradation, and I infer from this that most of the described American species are indeed independent phylogenetic lines.

In sorting through these collections, however, another problem has arisen that affects the use of existing keys and descriptions. In almost every species the males are darker than the females and frequently have colour patterns that are more distinctive and more sharply delineated than those of the females. In several instances the differences between the females are negligible whereas the colour patterns of the males are readily differentiated. This is suggestive that the distinctive patterns of the males have evolved as differential display stimuli to which only the correct female normally responds.

This sexual dichromatism complicates the matter of identification, because in existing keys females of several species would key out to the same place, and would run to a different couplet than would the male of the same species. To compound this situation, the shape of the female seventh sternite gives a different visual image depending on the position in which the female died, and use of this character for diagnosis must be attended by extreme caution. Until much more information is available concerning these problems, it seems best to treat all the currently described American species as distinct entities. In Text-fig. 82 the species of the *obscurinervis*-group have been arranged phylogenetically on a tentative basis using the characters illustrated by DeLong & Hershberger and by Linnavuori.

## *TAENIATICEPS*-GROUP

Of the described species, *ootacamundus, kilimanus, coronatus,* and *greensladei* are the only ones having distinctive colour patterns. The remainder have simply a more or less distinct black band across the top of the head. When abdomens of this unicolorous group were cleared and examined, the first thing evident was the striking similarity in all of them of the two pygofer spines: spine 1 long and slender, somewhat variable in length, and spine 2 short, black, and twisted at the apex. Closer inspection revealed small differences in the shape of the aedeagus, especially its profile. In large series of *indicus*, this structure has a distinctive broad shape compared with material from islands of the Indian Ocean and from Australia. Material from Asia Minor and North Africa has a distinctive clavate profile with a pronounced step where the two short processes arise; in some specimens from South Africa the aedeagus has essentially the same shape but is more massive; and in collections from the Sudan, unimodal intergrading populations were found that bridged the gap between the Asia Minor and South African types. A long series of material from Madagascar added two other types, one of them similar to the island type and the other differing only slightly from the Asia Minor type. In the first sorting it appeared as if the aedeagus varied randomly and locally in a fashion that almost defied segregation.

On further analysis two points of considerable interest emerged. First, in the three Indian species, *indicus, ootacamundus,* and *coronatus,* the aedeagi were of the same type (Text-figs. 25, 28, 30, 31). Furthermore, in a series of several thousand specimens from Kharagpur there was no indication of intergradation between the plain banding on the head of *indicus* and the colour patterns distinctive for *ootacamundus* and *coronatus.* These circumstances suggest strongly that a line of the *taeniaticeps* group dispersed into India, evolved the *indicus* type of aedeagus, and subsequently evolved into three species now differentiated primarily on the basis of head patterns. Second, in Madagascar two types of aedeagi occurred in some of the same localities yet no intergrades were found between them. This suggests that these two morphological types represent true genetic isolation and that two phylogenetic lines are involved.

On the basis of these two different cases, there seems to be a good possibility that the different morphological types of the *taeniaticeps* group, though sometimes remarkably close, represent distinctive species, and they have been so treated in this paper. Unquestionably a tremendous amount of collecting will be necessary to establish the true nature of these species but until this additional information is forthcoming, the only clear presentation seems to call for a course that may result in some splitting rather than taking the chance of obscuring future leads by lumping.

## PHYLOGENY

After the various species of *Exitianus* had been segregated, the next problem was to decipher the evolutionary sequence and geographic dispersal of the various lineages. As a first step in this evolutionary reconstruction, the species most similar to each other (essentially the *groups* expressed in the taxonomic analysis) were examined for inter-group differences. The various conditions found for any one character were then compared with conditions found in related genera in an effort to determine which were the ancestral and which the derived conditions.

As is true in most inducto-deductive investigations, certain theoretical possibilities are realized when the study commences, and character differences are viewed in their possible evolutionary light from the earliest observations of character differences. The present study was no exception. It was first noticed that in a number of Old World species, pygofer spine 2 was twisted at the apex (Text-fig. 24) and that the profile of the aedeagus was incised at the tip to form a fine curved point (Text-fig. 25), whereas in the New World species spine 2 was symmetrical (Text-fig. 19) and the profile of the aedeagus was blunt and little incised (Text-fig. 20). Next it was seen that (1) in one Old World species the pygofer had four, five, or six spines forming an even row (Text-fig. 15), whereas in most New World species there were only three spines with a large space between the two more ventral spines (spine 3 was missing, Text-fig. 19), and (2) in those Old World species with the contorted spine 2, there were only two spines. Finally, another group of African species came to light in which the plates were short and had only very small lateral setae (Text-fig. 54), whereas in all other species the plates were long and each had a lateral row of long spines (Text-fig. 78).

A search for related genera with which to compare conditions found in *Exitianus* soon divulged the information that (1) the genus *Nephotettix* was the only demonstrable close relative of *Exitianus*, (2) the genera *Gillettiella* Osborn, *Stirellus* Osborn & Ball, *Doratura* Sahlberg, and other genera possessing a long ovipositor were components of the same tribal unit (Doraturini) as *Exitianus*, and (3) many genera related to *Athysanus* Burmeister and *Recilia* Edwards belonged to the same large branch of the leafhoppers.

In *Nephotettix* the pygofer has a set of apical dark spines much like those in *Exitianus*. The dorsal spine (Text-fig. 80) seems to correspond with spine 1 of *Exitianus*; the lower four spines seem to correspond with spines 3 and 4 of *Exitianus* but are each represented by a pair of spines; spine 2 seems to be missing. The plate is long and triangular, bearing lateral long setae (Text-fig. 79), exactly like those of *Exitianus*. The aedeagus has the same parts as in *Exitianus*, but the shaft is highly ornamented (Text-fig. 81). *Nephotettix*, however, has an unusual opaque green ground colour and a sharply carinate forehead, and thus would appear to be a separate branch arising before the evolution of *Exitianus* as it is now represented. It seems reasonable to suppose that *Nephotettix* and *Exitianus* arose from a common ancestor that was remarkably like the *nanus* group of *Exitianus*, but probably having a more cryptic colour pattern similar to that found in many other grass-inhabiting leafhoppers.

Comparing the conditions exhibited by *Exitianus* and *Nephotettix* with those found in other leafhopper genera, it was evident that (1) the long plates with lateral spines represented the ancestral condition of this structure within *Exitianus*, and the short plates represented a derived condition; (2) the larger number of pygofer spines was the ancestral condition for the structures, the reduced number the derived condition; (3) the symmetrical pygofer spine 2 was the ancestral condition, the twisted spine 2 the derived condition; and (4) the blunt aedeagus was the ancestral condition for this structure, the incised and pointed type the derived condition.

From these considerations of ancestral and derived conditions, it is most likely that the ancestor of *Exitianus* (Ancestor 1 in Text-fig. 82) possessed triangular setose plates, at least four or five pygofer spines, all symmetrical, and a blunt aedeagus. These conditions are exemplified by *nanus*, which would therefore seem to be the living representative still bearing this archaic combination of ancestral characters. The remainder of the species have lost either spine 3 or spines 3, 4, and 5. It is therefore reasonable to suppose that Ancestor 1 gave rise to a lineage losing spine 3 and represented by Ancestor 2. Most of the native American species comprising the *obscurinervis* group represent this condition (Text-figs. 19, 20).

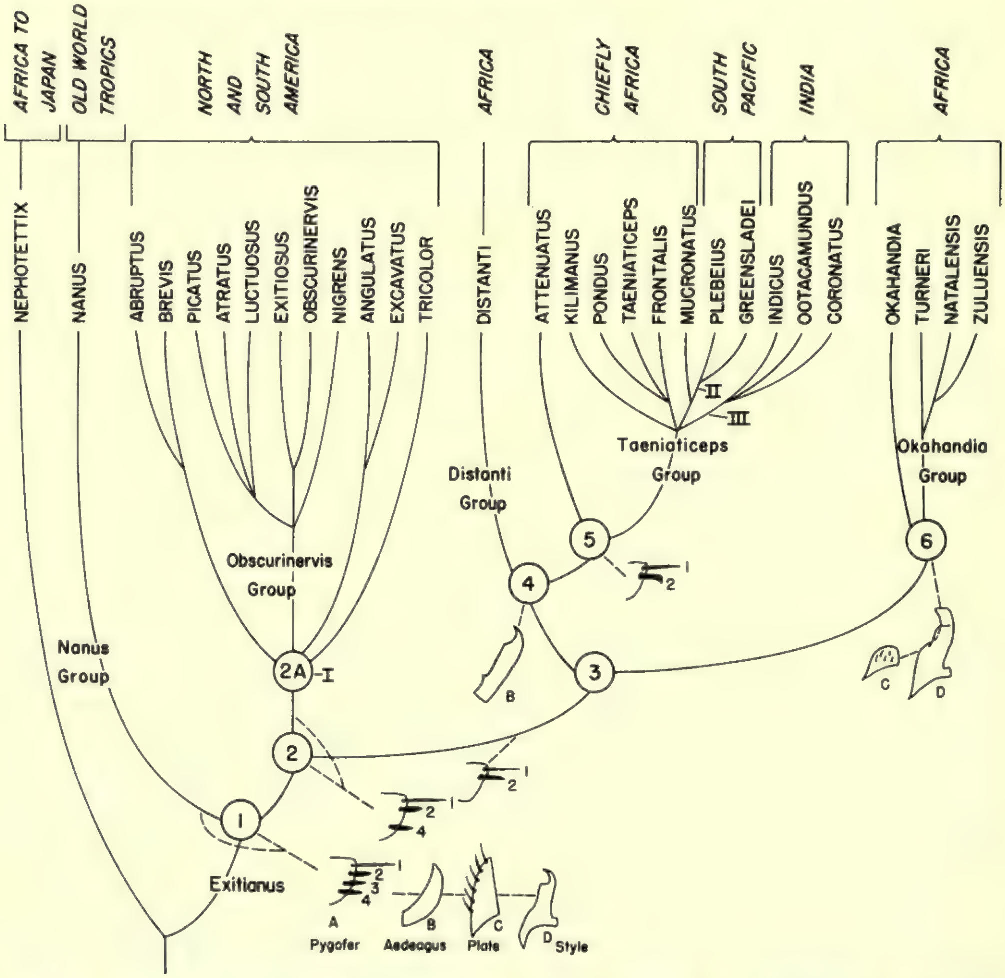

AFRICA TO JAPAN
OLD WORLD TROPICS
NORTH AND SOUTH AMERICA
AFRICA
CHIEFLY AFRICA
SOUTH PACIFIC
INDIA
AFRICA
NEPHOTETTIX
NANUS
ABRUPTUS
BREVIS
PICATUS
ATRATUS
LUCTUOSUS
EXITIOSUS
OBSCURINERVIS
NIGRENS
ANGULATUS
EXCAVATUS
TRICOLOR
DISTANTI
ATTENUATUS
KILIMANUS
PONDUS
TAENIATICEPS
FRONTALIS
MUCRONATUS
PLEBEIUS
GREENSLADEI
INDICUS
OOTACAMUNDUS
CORONATUS
OKAHANDIA
TURNERI
NATALENSIS
ZULUENSIS
II
III
Taeniaticeps Group
Okahandia Group
Distanti Group
Obscurinervis Group
Nanus Group
Exitianus
1
2
2A
I
3
4
5
6
A Pygofer
B Aedeagus
C Plate
D Style
1
2
3
4
B
C
D

FIG. 82. Proposed family tree of *Exitianus*. Arabic numerals refer to putative ancestral forms explained in text. Roman numerals indicate postulated past dispersals as follows: I, Africa to New World; II, Africa to South Pacific; III, Africa to India.

If one adds together the primitive conditions found in the remainder of the species (all native to the Old World), the result is a form having triangular setose plates, blunt aedeagus, and only two aedeagal spines. This ancestral form (Ancestor 3 of Text-fig. 82) differs from Ancestor 2 only in lacking pygofer spine 4. Ancestor 3 apparently gave rise to two lineages. In one of these, represented by Ancestors 4 and 5, the plates did not change but the aedeagus became incised and pointed at the tip; in the other lineage, represented by Ancestor 6, the aedeagus did not change but the plates became short and their setae greatly reduced. In Ancestor 4, pygofer spine 2 was probably still symmetrical. Such a stage may be represented by *distanti*, although in this species spine 2 is more elongate and in this respect is specialized over the theoretical structure of Ancestor 4. In addition to *distanti*, Ancestor 4 gave rise to Ancestor 5 in which pygofer spine 2 became twisted at the apex.

From Ancestor 5 evolved the species of the *taeniaticeps* group. The most primitive species of the group is *attenuatus*, in which pygofer spine 2 is only slightly contorted (Text-figs. 64, 65) and appears to represent a transitional condition leading to the more extreme asymmetry of this spine found in all other members of the *taeniaticeps* group. Nine of the remaining ten species of the group are readily grouped into three complexes. In the three species *indicus*, *ootacamundus*, and *coronatus* the aedeagal shaft is unusually short and broad (Text-figs. 25, 28, 30, 31). In *pondus*, *taeniaticeps*, and *frontalis* the dorsal points of the shaft are situated on a steplike sinuation of the profile (Text-figs. 34–36, 39–42, 47). In *mucronatus*, *plebeius*, and *greensladei* the basal profile of the shaft has no such basal sinuation (Text-figs. 43–46, 48–51). At present there seems to be no logical basis for knowing the exact affinities of these three complexes, hence in Text-fig. 82 their origin is depicted as a trichotomy. The tenth species, *kilimanus*, can at present be placed in the family tree only tentatively because of a lack of knowledge of the internal structures.

Ancestor 6, the 'short plate' offshoot of Ancestor 3, is represented by the *okahandia* group. In the species *okahandia*, the wing colour and head proportions are similar to those of paler species in the other groups; in *turneri*, *natalensis*, and *zuluensis* the tegmen or front wing has a fairly broad whitish costal stripe running the full length of the wing. These three apparently represent an offshoot of Ancestor 6 in which this character became established. In both *okahandia* and *turneri* the shape of the pygofer and the position of its apical spines is typical of other members of the genus, hence this condition must have been present in Ancestor 6 also. From this we can infer that the broad, flared styles found in these two species were also present in Ancestor 6. From the lineage leading to *turneri* there arose a branch in which the apex of the styles became elongate (Text-figs. 58, 61) and the apex of the pygofer became narrowed and upturned, pygofer spine 2 became greatly enlarged and spine 1 reduced (Text-fig. 60), ultimately lost in *zuluensis* (Text-fig. 63). Judging by the character by character changes that appear to characterize much of insect evolution, it is a reasonable prediction that additional collecting will bring to light an ancestral form having either the elongate style or the highly modified pygofer, but not both, now found in *natalensis* and *zuluensis*. Such a form would give us information as to which of these character changes evolved first.

When geographic distribution is compared with the postulated family tree of *Nephotettix* and *Exitianus* (Text-fig. 82), it is apparent that the genus is tropical or subtropical (except for the American *exitiosus*), and therefore has in all likelihood been restricted to the tropics and subtropics during almost all of its evolution. It is further apparent that the evolution of the entire group occurred in the Old World tropics with the exception of the *obscurinervis* group, which evolved in North and South America. Linnavuori recorded several South American specimens as *taeniaticeps*, which I am presuming represent a transport by man. If this is indeed the case, then the only natural intercontinental dispersal of which we have record was an Old World-to-New World dispersal of Ancestor 2.

Considering only the Old World records, the simplest explanation is reached by assuming that the genus evolved primarily in Africa. The *indicus* branch of Ancestor 5 apparently is a moderately old dispersal from Africa to southeastern Asia. The *plebeius-greensladei* branch of Ancestor 5 represents another dispersal eastward to Australia and the South Pacific. The present day widespread distribution of *nanus* and *frontalis* could be the result of natural dispersal. This seems especially likely with regard to *nanus*.

This probable African evolution of the genus poses a problem with regard to probably the oldest intercontinental dispersal of the genus, that of Ancestor 2 to the Americas, represented by Ancestor 2A in Text-fig. 82. If this occurred sufficiently long ago, possibly in the Eocene or early Oligocene, it would be simple to postulate an overland dispersal through subtropical climates across the Bering bridge. If this did happen it is puzzling that a branch of the genus comparable to the *obscurinervis* group did not evolve and persist in southeastern Asia.

A second possible solution is that Ancestor 2 was carried from Africa to South America by wind dispersal. This explanation seems more probable because of the discovery of long-distance migrations of much smaller leafhoppers in moving masses of warm, moist air. If this were the case, it is remarkable that apparently only one such dispersal occurred and became established during the entire evolution of the genus. Dispersal patterns of grass subgenera would indicate that satisfactory grass hosts for *Exitianus* have been present in the Americas for at least the probable period of *Exitianus* evolution.

A third explanation is that Ancestor 2 was a species with an unusually wide ecological tolerance, much like that of present day Nearctic *exitiosus*, that the species was able to cross into North America through warm temperate rather than tropical climates, and that subsequently, for one reason or another, the range of the widespread species became fragmented into Old and New World segments that eventually lost their ability to live in temperate climates.

A better insight into the circumstances surrounding the American dispersal of *Exitianus* may come when we understand more about the dispersal of grassland communities as a whole.

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G. E. J. NIXON

BULLETIN OF
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ENTOMOLOGY Vol. 22 No. 2
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Commonwealth Institute of Entomology

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*By* G. E. J. NIXON

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## SYNOPSIS

The genus *Microgaster*, as defined by Nixon in 1965, is revised and all species falling within the new definition, as far as they have been recognized, are taken into account. Forty-six species are keyed and discussed and fourteen of these are brought forward as new. Five species are put in synonymy.

## ACKNOWLEDGMENTS

In preparing this revision I have been much helped by a very fine collection of *Microgaster* from Ireland, received on loan from Mr. A. W. Stelfox of Newcastle, Co. Down, N. Ireland and now the property of the U.S. National Museum. I am much indebted to Mr. Stelfox. I am also grateful to the following gentlemen for the loan of useful material: Dr. Max Fischer of the Naturhistorisches Museum, Vienna, Dr. Wolter Hellén of the Helsinki Museum, Helsinki, Dr. C. F. W. Muesebeck of the U.S. National Museum, Dr. Jenö Papp of the Hungarian Natural History Museum, Budapest,and Dr. V. I. Tobias of the Zoological Institute, Leningrad.

## THE GENUS *MICROGASTER* LATREILLE

In my revision of the Microgasterini I redefined this genus (1965 : 267 and in key, : 13) restricting the use of the name to the group of species showing an obvious and natural relationship with the type-species, *deprimator* Fab. (Muesebeck & Walkley, 1951 : 135). Many of the better known of the remaining European species were transferred by me to the genus *Protomicroplitis*.

*Microgaster* of authors now consists virtually of two genera—*Microgaster*, as used here, essentially N. Temperate, and *Protomicroplitis* Ashmead with a world-wide distribution and best represented in tropical regions.

In 1965 I divided *Protomicroplitis* into many species-groups, some of which were established for species that were traditionally included in European *Microgaster*, such as *marginatus* Nees, *abdominalis* Nees and *scotica* Marshall.

The species of *Microgaster* s. str. are remarkably alike in general facies and quite impossible to recognize on the characters that have been used in the past. Species with red hind femora have usually been called *globata* L. Indeed, this is the name that appears most frequently in the literature on European *Microgaster*. I do not know to what species it should be applied. The Linnean type no longer exists and the little that Linné said about it indicates that it is a gregarious parasite living in stalks (? reeds) " in Culmis, intra folliculum communem, bombycinum, subrotundum, album ". *Microgaster globata* auctt. is a solitary parasite. The name "globata " is not used in this paper.

*Microgaster* s. str. was recognized as a distinct segregate within the older concept of the genus by earlier workers. Its species have always presented a tough taxonomic problem, baffling taxonomists by what was thought to be their extreme variability. Only Thomson, always a pioneer in the taxonomy of difficult groups of insects, succeeded in defining the limits of some of the species. Marshall, who lacked neither carefulness nor good judgement, was handicapped by the practice, fashionable in his time, of gumming insects on pieces of card, thus obscuring important areas of their anatomy. Much more recently Fahringer (1936), Telenga (1955) and Papp (1959, 1960) have tried to define what they consider to be species of *Microgaster* but none, unhappily, has discovered any new characters that permit even a partial break-down of the genus.

Having studied *Microgaster* intermittently for several years, I have been able to find a few structural characters that narrow considerably the margin of error in naming species. These characters are: the presence of teeth, or even a lobe (*deductor*), on the claws, the relative proportions of the abscissae of the basal vein of the fore wing and the degree of sclerotization of the hypopygium. But even with the help of these characters, I cannot claim to have cleared away all the difficulties of species-differentiation in *Microgaster*. The correlation of the North American and European species is specially in need of investigation.

When I defined the limits of *Microgaster* in 1965, I stated that the first abscissa of the discoideus is fully equal to the second. This is true of all the species included below with the exception of *consors* sp. n. from England. In all other respects, this species is typical of the genus.

As stated earlier, *Microgaster* is mainly confined to north temperate regions. It does, nevertheless, extend as far as the Oriental region, *tjibodas* from Java, *kuchingensis* from Borneo and *magnifica* from Queensland. I include also one species from Mexico, *nerione*.

In conclusion, it is important to state that this revision is based only on material that I have personally examined. For this reason, published host records are excluded, since no reliance can be placed on the identification of the parasites.

## KEY TO SPECIES

### FEMALES

1 Notaulic courses widened behind and here tending to coalesce (at most separated by a weak keel) so that the posterior half of the mesoscutum shows a large, more or less sunken area of coarse rugose-punctation or rugose-reticulation.

Gaster always in part red; tergite 2 extremely coarsely rugose and considerably longer than 3; apical tarsal segment of all legs enlarged; claws very large hypopygium heavily sclerotized all over and hence without trace of lateral creasing; *russatus*-group . . . . . . . . . . . . 2

– Notaulic courses, if indicated at all, never reaching beyond the middle of the disc; posterior part of mesoscutum thus never with an area of sunken rugosity; *deprimator*-group . . . . . . . . . . . . . . . 4

2 Hind coxa red; tergite 2 hardly more than twice as wide as long; hind tarsal segment 3 fully one and a half times longer than wide; ovipositor sheath distinctly longer than the hind basitarsus . . . . . . . . . . . . . 3

– Hind coxa blackish; tergite 2 fully two and a half times wider than long; hind tarsal segment 3 hardly longer than wide; ovipositor sheath distinctly shorter than the hind basitarsus

Gaster short, broad (Text-fig. 31); tergites 1–3 black; rest of gaster red; inner spur of the hind tibia not reaching middle of hind basitarsus.
Europe **rugulosus** Nees (p. 68)

3 Tergites 1 and 2 and most of 3 red, the rest black; head behind the ocelli shiny and with only weak traces of punctation; preapical segment of the antenna not more than twice as long as wide; flagellum yellow. Europe. Japan
**russatus** Haliday (p. 67)

– Tergites 1 and 2 black, the rest broadly banded with black or more or less entirely black; head behind the ocelli dull, densely rugose-punctate; preapical segment of the antenna fully two and a half times longer than wide; flagellum brownish but paler beneath. North America . . . . . **melligaster** Provancher (p. 68)

4 Tergite 2 entirely smooth; costad abscissa of the basalis about one fifth as long as the mediad abscissa

Hind coxa and hind femur black. Europe . . . **politus** Marshall (p. 48)

– Tergite 2 never as smooth as this; almost always very strongly, coarsely sculptured; if almost smooth (*tjibodas*) then the hind coxa in part, and the hind femur entirely, yellow; costad abscissa of the basalis at least one quarter as long as the mediad abscissa . . . . . . . . . . . . . . . . . 5

5 Thorax entirely bright reddish fulvous; hypopygium without lateral, membranous creases and, seen from the side, with its apex produced to form a long, strongly sclerotized spine (Text-fig. 15)

Preapical segment of the antenna tapered distally and about two and a half times longer than its basal width; wings strongly, evenly, smoky yellow. Queensland. . . . . . . . . . . . **magnificus** Wilkinson (p. 66)

– Thorax black or blackish; hypopygium not thus produced at apex, though sometimes it may be without lateral creases (*grandis*-subgroup) . . . . . 6

6 Face either virtually impunctate or more often with an even punctation, there being no indication of transverse or almost transverse vermiculate rugosities towards sides.

Vertex around the ocelli smooth, shining; claws simple . . . . . 7

– Face much less shining and with a predominantly rugose sculpture and almost always with a clear indication of vermiculate rugosities towards sides; rarely the sculpture reduced to a vague, confused aciculation (*tjibodas*) or obsolescent (*nerione*) . . . . . . . . . . . . . . . . 14

7 Face smooth, except for minute setiferous punctures.

Basal half of ventral surface of gaster bright yellow; flagellum long, thin, with somewhat outstanding pubescence; its preapical segment hardly less than twice as long as wide. Europe . . . . . . . . **procerus** Ruthe (p. 45)

– Face with distinct punctation . . . . . . . . . . . . 8

8 Face, anterior part of mesopleurum, mesosternum, with a heavy discrete punctation; preapical segment of antenna about two and a half times longer than wide;

hypopygium, except at extreme tip, heavily sclerotized all over, without trace of a fold along the middle line

Very large species, *c.* 6 mm., with the whole of the hind leg blackish. E. Siberia . . . . . . . . **reticulatus** Shestakov (p.65)

– Face and more especially the anterior part of the mesopleurum and mesosternum with a much finer, sparser punctation, the surface at first sight sometimes appearing polished and almost impunctate; preapical segment of the antenna at most hardly twice as long as wide; hypopygium, except in one species which has the hind femur almost entirely red, tightly folded along the middle line in death and with more or less distinct lateral creases . . . . . . . . . 9

9 Hairy part of ovipositor sheath very distinctly less than half as long as the hind tibia; hind femur red, blackened at tip; inner spur of the hind tibia not extending beyond basal two thirds of hind basitarsus.

Very small species, *c.* 2·5 mm. without ovipositor. Europe **opheltes** sp. n. (p. 48)

– Hairy part of ovipositor sheath at least about two thirds as long as the hind tibia; if somewhat shorter, then the hind femur entirely dark; inner spur of the hind tibia longer . . . . . . . . . . . . . . . 10

10 Hind femur entirely red.

Antennal segments 15–17 somewhat barrel-shaped so that the apical antennal segments appear loosely articulated (Text-fig. 5). Europe

**fulvicrus** Thomson (p. 45)

— Hind femur at least with a darkened tip . . . . . . . . . . 11

11 Hind femur entirely black . . . . . . . . . . . . 12

— Hind femur red with a darkened tip . . . . . . . . . . . 13

12 Hairy part of ovipositor sheath not more than two thirds as long as the hind tibia; posterior tangent to the anterior ocellus not, or hardly, cutting the posterior pair.

Very dark species with heavily infumated wings; antennal segments 15–17 cylindrical, with 17 varying from one and a half to one and two thirds times longer than wide. Europe . . . . . . . . **curvicrus** Thomson (p. 46)

— Hairy part of ovipositor sheath about three quarters as long as the hind tibia; posterior tangent to the anterior ocellus distinctly cutting the posterior pair (Text-fig. 14). Europe . . . . . . . . **erro** sp. n. (p. 46)

13 Tergites with very narrow, pale, apical margin; tergite 3 with a yellowish spot on each side; first abscissa of the discoideus not longer than the second; setae of the median cell as dark towards base of cell as at apex. Europe **obsepiens** sp. n. (p. 47)

— Tergites entirely black; no yellow spot on each side of tergite 3; first abscissa of the discoideus more or less distinctly longer than the second; setae of the median cell dark only within about apical quarter; elsewhere colourless and almost absent. Ireland . . . . . . . . **fulvicrus** Thomson, var. A (p. 46)

14 Hind coxa entirely, or in large part, yellow; (if the yellow colour is not sharply discrete, then the apical tergites are marked with yellow) . . . . . . 15

— Hind coxa black or dark brown; at most somewhat paler beneath or at apex (*epagoges*, *brittoni*) . . . . . . . . . . . . . . . 19

15 Hind coxa entirely yellow.

Gaster conspicuously pale-marked or banded with yellow on apical segments . 16

— Hind coxa darkened at base . . . . . . . . . . . 17

16 Claws long, thin, evenly curved (Text-fig. 12); inner spur of the middle tibia not reaching apex of basal segment of tarsus; tergites 4–6 with weakly indicated, pale, longitudinal, median band. Europe . . . . **auriculatus** Fab. (p. 55)

— Claws of ordinary form; inner spur of the middle tibia reaching apex of basal segment of tarsus; tergites 4–6 with dark, longitudinal, median band, sometimes so narrow that segments appear virtually yellow.

Hind tarsus and apex of hind tibia deeply infuscate. North America

**leechi** Walley (p. 65)

17 Apical tergites conspicuously banded with yellow.

Ventral surface of gaster entirely yellow; hind leg distal to coxa entirely reddish yellow; anterior half of mesoscutum with fine, shrivelled rugosity, stronger along the imaginary course of the notaulices; radius leaving stigma far distal to middle. North America . . . . . . . . . **gelechiae** Riley (p. 65)

— Apical tergites entirely dark . . . . . . . . . . . . . 18

18 Gaster largely dull reddish; tergite 2 almost smooth; mesoscutum, except for its anterior declivity, polished, smooth-looking; hind femur entirely yellow; claws with minute, basal spine. Java . . . . . . **tjibodas** Wilkinson (p. 67)

— Gaster virtually black; tergite 2 very coarsely rugose-reticulate; mesoscutum markedly dull, rugose almost all over; hind femur weakly infuscate at apex; claws with 2–3 teeth. North America. England **pantographae** Muesebeck (p. 62)

19 Claws with a conspicuous, basal lobe (Text-fig. 9); head from in front markedly triangular (Text-fig. 29).

Mesoscutum densely, heavily punctate all over and, at the origin of the notaulic courses, rugose-punctate. Europe. . . . . . **deductor** sp. n. (p. 49)

— Claws never lobed, but sometimes toothed or pectinate; head from in front not triangular . . . . . . . . . . . . . . . . 20

20 Hind claw with one to two long teeth or two to four fine, close, black spines (Text-figs. 8, 6) . . . . . . . . . . . . . . . 21

— Hind claw at most with a single, fine, black spine at base . . . . . . 30

21 Hind claw bent almost at right angles near base and with one to two strong teeth (Text-fig. 8); the distal tooth almost as pale and as long as that part of the claw distal to it.

Preapical segment of the antenna more or less square in outline; hairy part of the ovipositor sheath fully three quarters as long as the hind tibia . . . 22

— Hind claw less bent and with two to four spine-like teeth that are somewhat darkened and do not reach the level of the claw-tip; the claw, hence, simply pectinate (Text-fig. 6) . . . . . . . . . . . . . . . 24

22 Metacarp short, only about one and one third times longer than its distance from the apex of the radial cell; stigma rather short and broad (Text-fig. 25); at least the anterior half of the mesoscutum with much fine, shrivelled rugosity, the lines of the notaulices more strongly rugose; tergite 2 very coarsely rugose-reticulate, without obvious longitudinal elements in the sculpture; slightly longer than 3, the dividing suture deep, somewhat rugose; tergite 3 with distinct traces of rugosity (vague rugose-punctation); inner spur of the hind tibia longer. North America

**congregatiformis** Viereck

— Metacarp longer, at least twice as long as its distance from the apex of the radial cell; stigma longer, narrower; anterior half of the mesoscutum more shiny and smoother; tergite 2 with weaker rugosity, in which there are obvious longitudinal elements; not longer than 3, the dividing suture smooth; tergite 3 virtually smooth; inner spur of the hind tibia shorter, only about three fifths as long as the hind basitarsus 23

23 Flagellum bristly, the pubescence of segment 17 being equal to about one third the width of the segment (Text-fig. 1); hind femur entirely red or with faint, dark patch above at base; no trace of short, longitudinal keel between the posterior ocelli. Europe . . . . . . . . **crassicornis** Ruthe (p. 49)

– Flagellum less bristly, the pubescence of segment 17 not more than one quarter the width of the segment; hind femur blackened at base and along upper margin; nearly always a very short, longitudinal keel between the posterior ocelli. Europe.

**areolaris** Thomson (p. 49)

24 Hypopygium heavily sclerotized all over and without a trace of lateral creases.

Hind femur black; hind tibia deeply infuscate but slightly paler along dorsal surface; ovipositor sheath about half as long as the hind tibia; ovipositor thick, evenly curved. Mexico . . . . . . . . **nerione** sp. n. (p. 68)

— Hypopygium more feebly sclerotized laterally thana long the middle line and always with some lateral creasing in the dead insect . . . . . . . . 25

25 First abscissa of the discoideus distinctly shorter than the second (Text-fig. 23); costad abscissa of the basalis hardly more than one quarter as long as the mediad abscissa; hind claw with two pale spines; ovipositor sheath about three quarters as long as the hind tibia. England . . . . . . . **consors** sp. n. (p. 50)

— First abscissa of the discoideus as long as, or longer than, the second; costad abscissa of the basalis fully one third as long as the mediad abscissa; hind claw with two to four thickened spines . . . . . . . . . . . . . 26

26 Hind coxa somewhat brownish beneath; middle coxa yellowish brown.
Flagellum fulvous beneath; hind tibia reddish fuscous, becoming faintly darker towards apex and with yellowish, basal ring. North America **epagoges** Gahan (p. 52)

— Hind and middle coxa black . . . . . . . . . . . . . 27

27 Metacarp more sharply defined, short, only a little longer than its distance from the apex of the radial cell; hind femur black; hairy part of the ovipositor sheath distinctly less than half as long as the hind tibia.
Mesoscutum conspicuously punctate over anterior half. Europe **tibialis** Nees (p. 50)

— Metacarp less sharply defined, at least about one and a half times longer than its distance from the apex of the radial cell and then, *canadensis*, mesoscutum not obviously punctate in front; hind femur red, with at most the apex darkened; hairy part of ovipositor sheath fully two thirds as long as the hind tibia . . 28

28 Metacarp about one and a half times longer than its distance from the apex of the radial cell; first abscissa of the radius virtually straight; hind tibia with weak, but distinct apical infuscation; hairy part of ovipositor sheath hardly two thirds as long as the hind tibia. North America . . . . **canadensis** Muesebeck (p. 64)

— Metacarp about twice as long as its distance from the apex of the radial cell; first abscissa of the radius markedly convex on its distal side (Text-fig. 24); hind tibia with conspicuous, apical infuscation; hairy part of the ovipositor sheath distinctly more than two thirds as long as the hind tibia . . . . . . . 29

29 Scutellum coarsely punctate; the punctures large and separated by one to two diameters, except posteriorly; mesopleurum towards front with clearly defined, dull surface sculpture between its large, round punctures. Europe **eupolis** sp. n. (p. 51)

— Scutellum with at most scattered punctures along sides; mesopleurum smooth and shining between its punctures
Species with deeply blackened hind tarsus and black tip to hind tibia, contrasting with deep red hind femur. Europe. Mediterranean Region
**deprimator** Fab. (p. 51)

30 Costad abscissa of the basalis hardly one quarter as long as the mediad abscissa.
Gaster yellow on basal half beneath; antenna thin, with segment 16 fully twice as long as wide; flagellum bristly; hairy part of ovipositor sheath about one third as long as the hind tibia. Europe. North America . **novicius** Marshall (p. 53)

— Costad abscissa of the basalis one third to one half as long as the mediad abscissa . 31

31 Hind tibia black with white basal ring; fore wing hyaline, sharply infuscate distal to middle of radial cell and with dark band enveloping first abscissa of radius
Hind spurs white and hind tarsus as black as its tibia; scape somewhat reddish; costad abscissa of the basalis at most about one third as long as the mediad abscissa (Philippines); much shorter than this (type series, Borneo). Indo-Australian Region . . . . . . . **kuchingensis** Wilkinson (p. 66)

— Hind tibia never black with white, basal ring; hyaline and infuscate areas of fore wing never as sharply discrete as this . . . . . . . . . 32

32 Eyes strongly convergent below (Text-fig. 32).
Small species, *c.* 2·3 mm., with the mesoscutum confusedly rugose-punctate almost all over and the hind femur bright reddish yellow with darkened apex. Macedonia . . . . . . . . . . **phryne** sp. n. (p. 63)

— Eyes never as strongly convergent below as this . . . . . . . 33

33 Hypopygium very short, heavily sclerotized all over, not tightly folded along the middle line and without trace of lateral creases.

Antenna very long, the preapical segment fully twice as long as wide; surface between and around the ocelli with some sort of sculpture; hairy part of ovipositor sheath at most nearly half as long as the hind tibia, its apical edge with a row of stiff bristles that contrast with the longer hairs below them (Text-fig. 11); this tuft poorly defined in the North American *brittoni* but this species has the dorsum of the gaster conspicuously yellow-marked . . . . . . . . . 34

— Hypopygium usually considerably longer and not thus evenly and heavily sclerotized so that, in the dead insect, it tends to be tightly folded along the middle line and usually shows one or more lateral creases; (creases hardly evident in *fischeri* but this species is less than 2·5 mm.) . . . . . . . . . . . 36

34 At least tergite (2 + 3) heavily marked with yellow; hairy part of ovipositor sheath almost half as long as the hind tibia. North America . ***brittoni*** Viereck (p. 54)

— Dorsum of gaster entirely black; hairy part of ovipositor sheath only about one third as long as the hind tibia . . . . . . . . . 35

35 Mesoscutum, at least over anterior two thirds, with large, well separated punctures; hairs of the head and mesoscutum unusually long and conspicuous; hind tibia infuscate at apex. Europe . . . . . . ***grandis*** Thomson (p. 53)

— Mesoscutum without distinct punctation, but strongly rugulose in front; hairs of the head and mesoscutum short, inconspicuous; hind tibia uniformly red throughout. Europe . . . . . . . . . ***acilius*** sp. n. (p. 53)

36 Claws unusually large and conspicuous (Text-fig. 10); mesoscutum dull, densely rugose-punctate almost everywhere; apart from the medial, polished area, the mesopleurum in front and below is densely rugose-punctate; posterior tangent to the anterior ocellus not touching the posterior pair; the rugosity of the mesopleurum extends over the area posterior to the sternaulic pit. Europe

***deceptor*** sp. n. (p. 55)

— Claws normal; mesoscutum never as dull or as extensively sculptured as this, though there may be conspicuous, shrivelled rugosity along the imaginary course of the notaulices; mesopleurum shiny and with at least a somewhat superficial, less close punctation; ocelli in a lower triangle, the posterior tangent to the anterior ocellus at least touching the posterior pair; if the mesopleurum shows coarse rugosity, then this does not extend over the area posterior to the sternaulic pit . . 37

37 First abscissa of the discoideus very distinctly longer than the second (Text-fig. 22)

Mesoscutum rugulose almost all over; hind femur infuscate at tip; hind tibia deeply infuscated on about apical third; basal half of ventral surface of gaster bright yellow. Austria . . . . . . . . ***caris*** sp. n. (p. 61)

— First abscissa of the discoideus never distinctly longer than the second . . . 38

38 Ovipositor sheath very long, its hairy part as long as the hind tibia.

Both hind femur and hind tibia with blackened tip; flagellum very slender, with bristly pubescence and the preapical segment at least one and a half times longer than wide. Europe . . . . . . . . ***subcompletus*** Nees (p. 56)

— Ovipositor sheath at most three quarters as long as the hind tibia and then the hind femur is not tipped with black . . . . . . . . . . 39

39 Distance between the anterior ocellus and a posterior ocellus about equal to the diameter of the anterior ocellus.

Surface between and around the ocelli almost smooth; hind femur entirely red; hind tarsus almost as red as its tibia; hairy part of ovipositor sheath about two thirds as long as the hind tibia. Europe . . ***laeviscuta*** Thomson (p. 56)

— This distance usually markedly less than the diameter of the anterior ocellus; if not, then the surface around the ocelli shows some striation radiating outwards from the ocellar triangle or the hind femur is blackened at least at apex . . . 40

40 Tergite 1 tending to become smooth and polished over the greater part of its horizontal surface; hind tibia tricoloured, deeply infuscate over distal half, red at middle and whitish on about basal fifth

Mesoscutum smooth, shining, even in front; scape bright reddish. S. Europe **asramenes** sp. n. (p. 62)

— Tergite 1 strongly sculptured everywhere; hind tibia not tricoloured . . . . 41

41 Hypopygium very strongly developed, long, acute, extending well beyond the apex of the gaster (Text-fig. 18).

Hind femur blackish; hind tibia becoming progressively more strongly infuscate from base to apex; flagellum very bristly, with the preapical segment about one and one third times longer than wide; metacarp nearly three times as long as its distance from the apex of the radial cell. Finland . . **ductilis** sp. n. (p. 58)

— Hypopygium rarely approaching this length and then the hind femur is entirely or predominantly reddish or yellowish and the flagellum is not noticeably bristly . 42

42 Hind femur varying from entirely black to red with usually at least a dark streak above at base; if entirely red, then wings virtually hyaline.

Small species, at most about 3 mm., without ovipositor . . . . . 43

— Hind femur rarely blackened and then the species are considerably larger . . 44

43 Larger, about 3 mm. without ovipositor; hind tibia pale reddish, without trace of apical infuscation

Wings virtually hyaline; antenna short with segments 16–17 and often 15 not or only very slightly longer than wide; ovipositor evenly curved throughout (Text-fig. 17), thinner than in *laeviscuta*. Europe. North America. **hospes** Marshall (p. 57)

— Smaller, about 2·3 mm. without ovipositor; hind tibia becoming infuscate in about apical third

Hind femur infuscate almost throughout or entirely; ovipositor sheath very short, hardly more than half as long as the hind tibia; propodeum having a somewhat flattened appearance. Europe . . . . . . . **fischeri** Papp (p. 64)

44 Anterior half of mesoscutum very distinctly punctate, though the punctures tend to become crowded and form rugose-punctation at the origin of the imaginary notaulic courses; anterior part of the mesopleurum somewhat coarsely rugose.

Wings strongly infumated; at least the apex of the hind femur strongly infuscated; surface around the ocelli polished, smooth; ovipositor sheath with numerous, outstanding bristles. Austria . . . . . . **famulus** sp. n. (p. 59)

— Anterior half of mesoscutum without such distinct punctation though there may be considerably rugosity along the course of the notaulices; with punctation feebly indicated at front of middle lobe; anterior part of mesopleurum with a prevailing sculpture of discrete punctation that may be very weak or superficial; if the sculpture here is somewhat coarse and not resolvable as punctation, then the wings are virtually hyaline . . . . . . . . . . . . . 45

45 Tergite 2 at most about two and a half times wider than long (Text-fig. 33) and distinctly longer than 3.

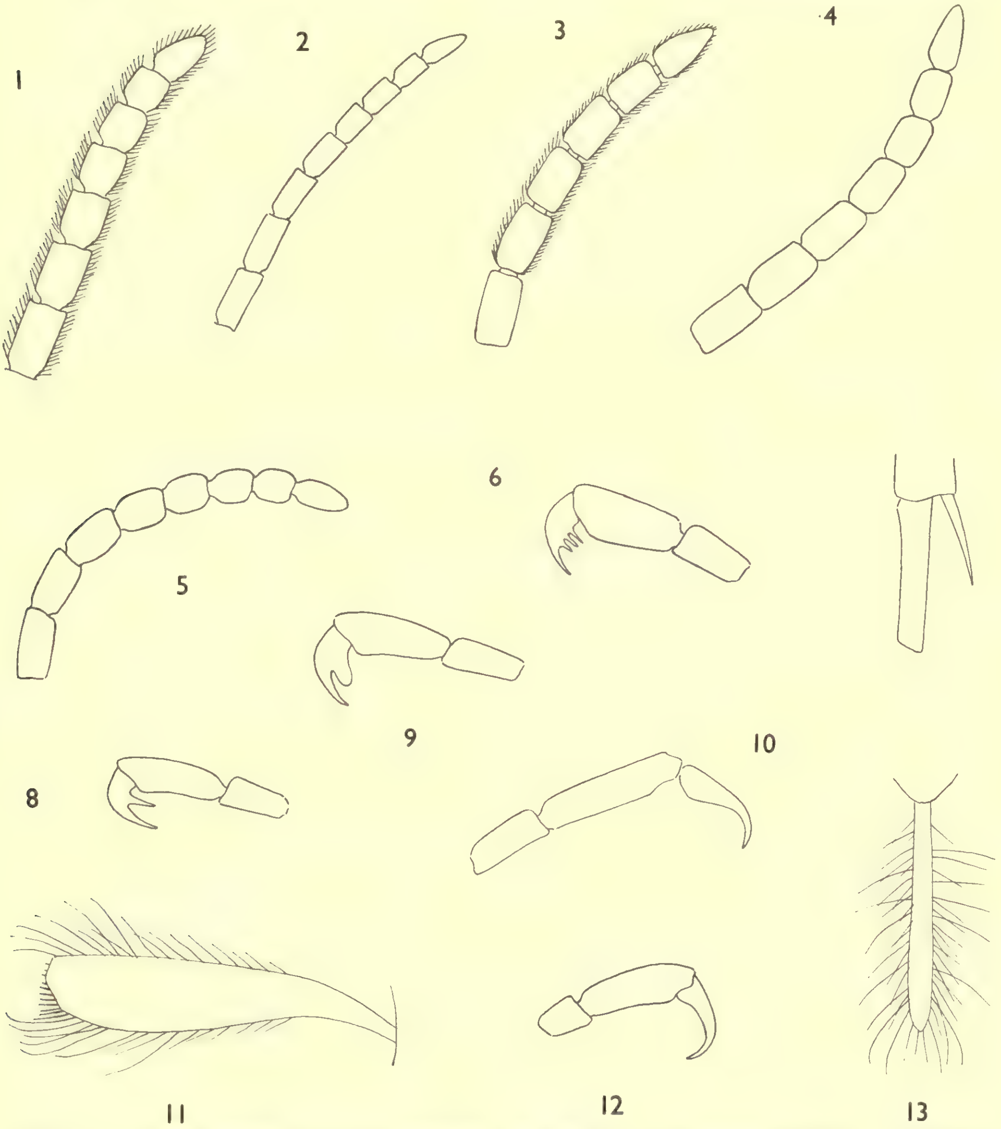
Hairy part of the ovipositor sheath a little less than half as long as the hind tibia; hind tarsus almost as red as its tibia; head considerably sculptured around and between the ocelli; flagellum long, tapering, the preapical segment fully one and a half times longer than wide; front part of mesoscutum strongly rugose or rugose-punctate. Europe . . . . . . . **sticticus** Ruthe (p. 59)

— Tergite 2 about three times wider than long and not distinctly longer than 3; hairy part of ovipositor sheath distinctly more than half the length of the hind tibia . 46

46 Femora predominantly yellowish; smaller, *c.* 3 mm. without ovipositor. North America . . . . . . . . . . . . **peroneae** Walley (p. 58)

— Femora predominantly reddish; larger, *c.* 4·2 mm. without ovipositor . . . 47

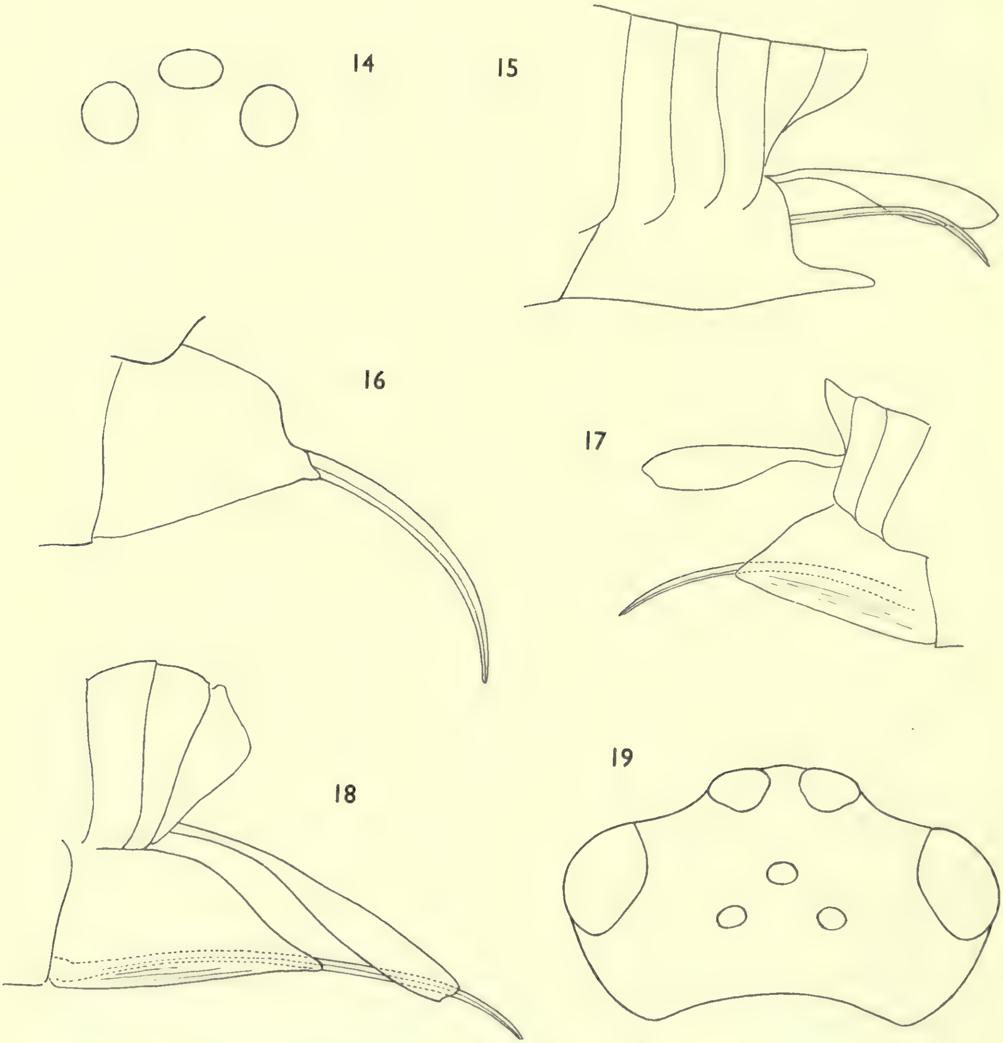
47 Ovipositor abruptly downcurved in about apical third; no transverse striation to the side of the ocelli; spines of the outer side of the hind tibia rather short and sparse, especially at about middle; sculpture at the origin of the notaulic courses fine, weak. Europe . . . . . . . **parvistriga** Thomson (p. 61)



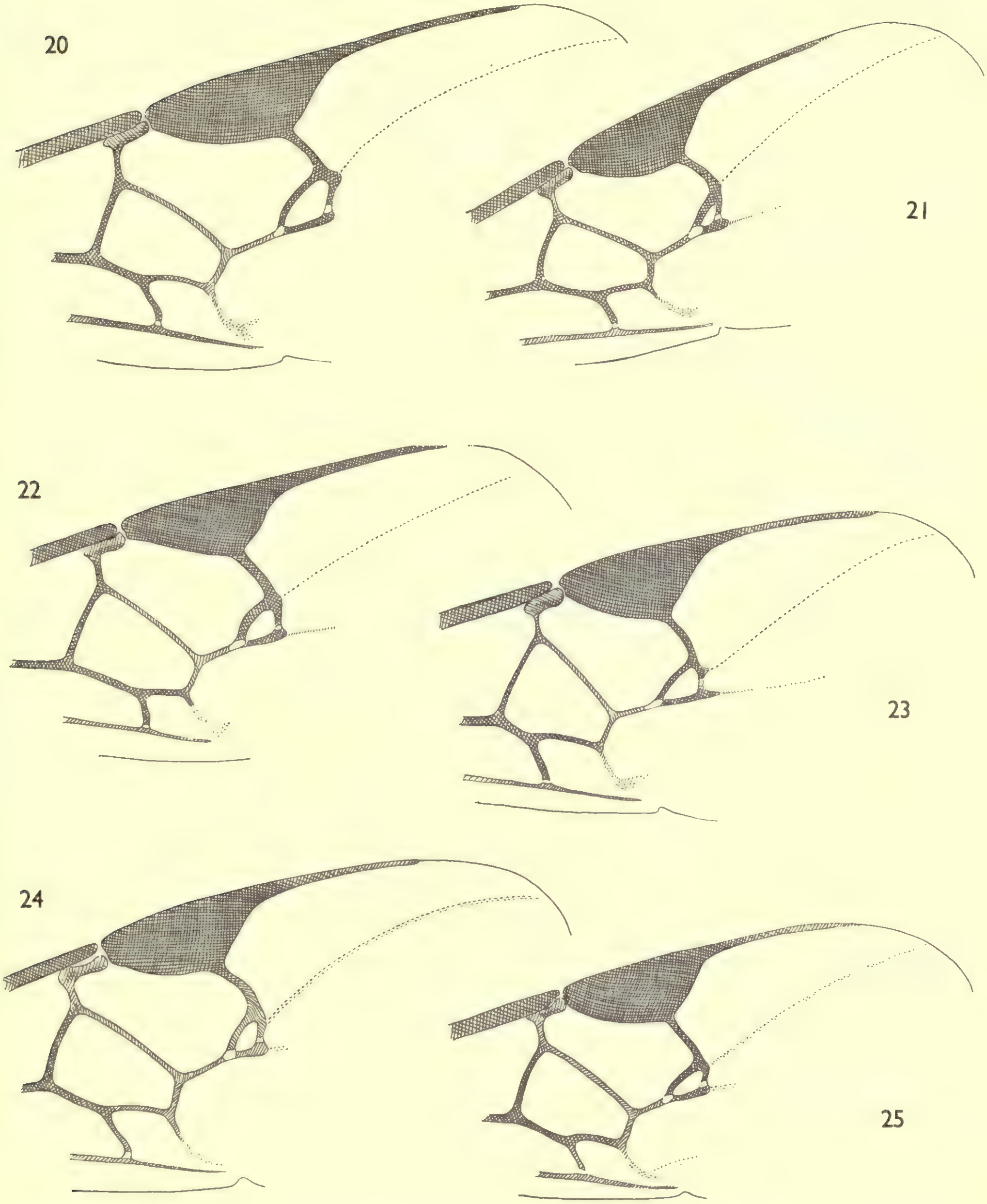
Figs. 1–13. Microgaster, ♀: Apical flagellar segments of 1, *crassicornis* Ruthe. 2, *sticticus* Ruthe. 3, *erro* sp. n. 4, *curvicrus* Thomson. 5, *fulvicrus* Thomson. 6, *deprimator* Fab., hind claw. 7, *laeviscuta* Thomson, inner spur of left hind leg. 8, *crassicornis* Ruthe, hind claw. 9, *deductor* sp. n., hind claw. 10, *deceptor* sp. n., hind claw. 11, *grandis* Thomson, ovipositor sheath (lateral). 12, *auriculatus* Fab., middle claw. 13, *procerus* Ruthe, ovipositor sheaths (dorsal).

— Ovipositor weakly but evenly curved throughout; considerable striation to the side of the ocelli; spines of the outer side of the hind tibia longer, more numerous; sculpture at the origin of the notaulic courses very coarse, the sculpture extending much further onto the disc than in *parvistriga*.

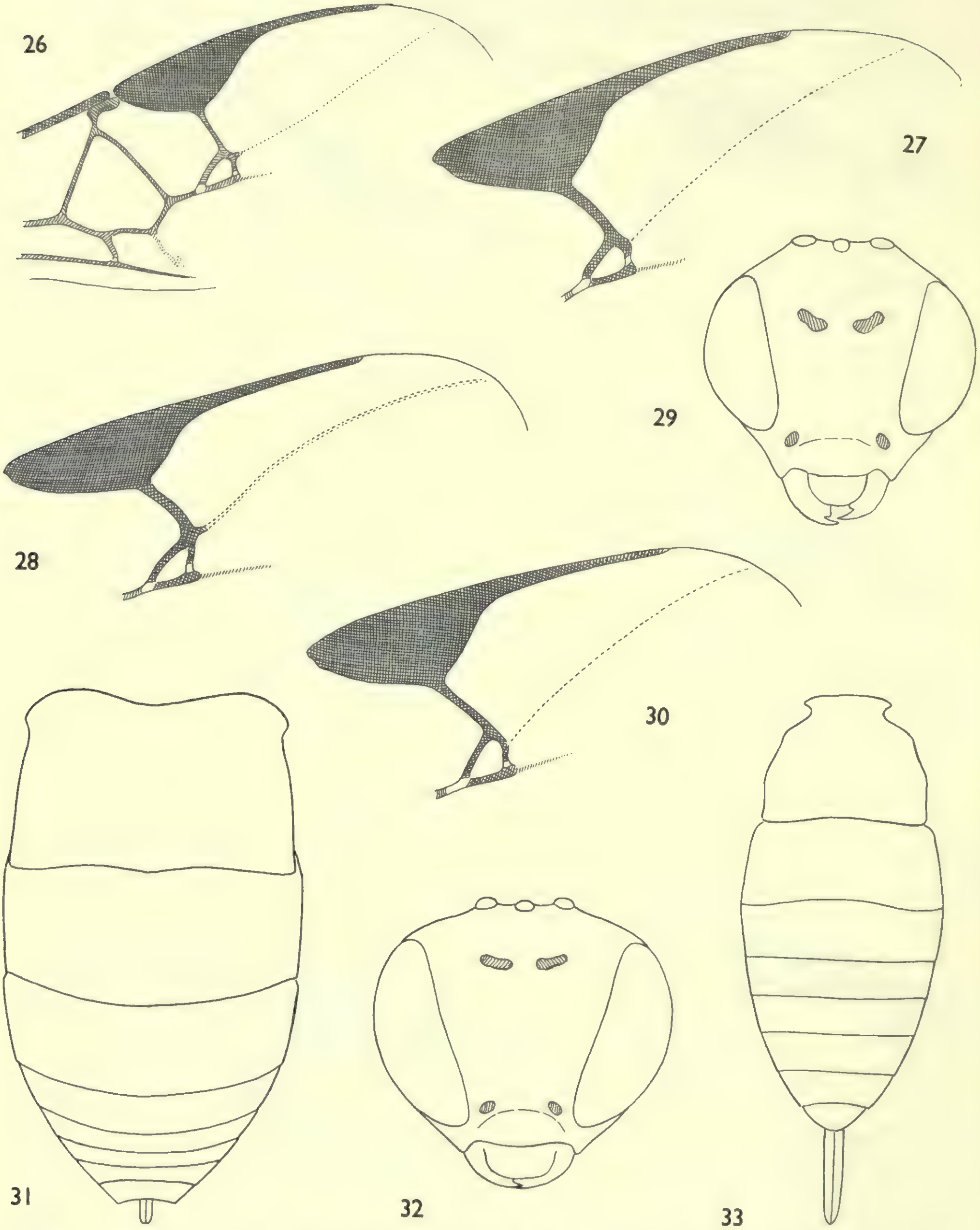
Hind femur red with at most the faintest trace of apical infuscation. Europe **alebion** sp. n. (p. 60)



FIGS. 14–19. *Microgaster* ♀: 14, *erro* sp. n., ocellar triangle. 15, *magnificus* Wilkinson, apex of gaster (lateral). 16, *nerione* sp. n., hypopygium and ovipositor (lateral). 17, *hospes* Marshall, apex of gaster (lateral). 18, *ductilis* sp. n., apex of gaster (lateral). 19, *deceptor* sp. n., head from above.



FIGS. 20–25. *Microgaster*, ♀: Distal half of fore wing of 20, *deceptor*, sp. n. 21, *tibialis* Nees. 22, *caris*, sp. n. 23, *consors* sp. n. 24, *deprimator* Fab. 25, *congregatiformis*, Viereck.



Figs. 26–33. *Microgaster*, ♀: Distal part of fore wing of 26, *politus* Marshall. 27, *fulvicrus* Thomson. 28, *grandis* Thomson. 29, *deductor* sp. n.; head (from in front). 30, *laeviscuta* Thomson, distal part of fore wing. 31, *rugulosus* Nees, gaster (dorsal). 32, *phryne* sp. n., head (from in front). 33, *sticticus* Ruthe, gaster (dorsal).

## ***Microgaster procerus*** Ruthe

(Text-fig. 13)

*Microgaster procerus* Ruthe, 1860 : 115.

♀. Basal half of ventral surface of gaster yellow. Maxillary palpi pale yellow. Hind femur red with darkened tip; hind tibia at apex and hind tarsus, infuscated. Fore wing faintly smoky; metacarp paler than the stigma.

Head above smooth, polished. Flagellum thin, somewhat pale beneath, distinctly bristly; the preapical segment almost twice as long as wide.

Mesoscutum having a highly polished appearance, even in front, where there are traces of very superficial punctation; no rugosity at the origin of the notaulic courses. Costad abscissa of the basalis fully two-fifths as long as the mediad abscissa; first abscissa of the discoideus distinctly a little longer than the second. Inner spur of the hind tibia fully three quarters as long as the hind basitarsus.

Tergite 1 somewhat narrowly triangular, its sculpture towards sides tending to be predominantly longitudinal. Hairy part of ovipositor sheath about half as long as the hind tibia; seen from above, the hairs of the sheaths are particularly long and outstanding (Text-fig. 13).

♂. Like the female in colour and sculpture.

Length: ♂ ♀, *c.* 5 mm. without ovipositor of female.

Material examined: FINLAND. GERMANY. IRELAND. 3 ♂, 4 ♀.

Distinct among those species with non-rugose face on general reduction of sculpture together with colour, especially that of the ventral surface of the gaster.

The single Irish male I have seen differs from two Finnish males in that the middle femur is streaked with black above and the base of the gaster is not bright yellow; this may be due to discoloration.

## ***Microgaster fulvicrus*** Thomson

(Text-figs. 5, 27)

*Microgaster fulvicrus* Thomson, 1895 : 2240.

♀. Maxillary palpi brownish, the basal segments almost black. Hind femur entirely red; hind tibia with darkened tip, sometimes hardly noticeable; hind tarsus deeply infuscated. Fore wing somewhat darkened; the radial cell contrastingly paler than the large third cubital cell adjacent to it.

Head above smooth, polished. Apical flagellar segments (Text-fig. 5).

Front part of mesoscutum with faint to rather sharp, fine punctation. Scutellum virtually impunctate. Costad abscissa of the basalis about one third as long as the mediad abscissa; stigma rather broad, emitting the radius virtually at middle (Text-fig. 27).

Tergite 2 as coarsely rugose as tergite 1. Hairy part of the ovipositor sheath slightly more than half as long as the hind tibia; outstanding hairs fewer than in *procerus* (cf. Text-fig. 13).

♂. Like the female in colour and associated with it on the evidence of the short series bred from *D. ocellana*. Unless careful attention is paid to the sculpture of the face, the male is virtually indistinguishable from the males of several other species.

Distribution: ENGLAND. FINLAND. IRELAND. SWEDEN.

Host: *Depressaria ocellana* Fab. (Oecophoridae), in England, Westmorland, Witherslack. Parasites emerge in May from hosts collected previous June.

Type in the Entomological Institute, Lund, Sweden. Examined.

*Microgaster fulvicrus*, var. A. Seven females from counties Wicklow and Dublin in Ireland. These differ from typical *fulvicrus* as follows: the apex of the hind femur is conspicuously blackened; the two preapical segments of the antenna are slightly more elongate; the anterior part of the mesoscutum is more densely and more sharply punctate; the first abscissa of the discoideus is usually distinctly longer than the second; the hairs of the median cell are darkened only in about apical quarter of cell; elsewhere the cell appears bare, the scattered setae being sparse and colourless, whereas in typical *fulvicrus*, the setae are dark wherever they occur.

### ***Microgaster curvicrus*** Thomson

(Text-fig. 4)

*Microgaster curvicrus* Thomson, 1895 : 2242.

♀. Middle and hind femur entirely black; front femur yellow on about distal half; hind tibia dusky red, darkened at tip but the infuscation not sharply discrete and more extensive on inner side. Radial cell more or less as dark as the third cubital cell adjacent to it.

Flagellum differs from that of *fulvicrus* in that the two preapical segments are more elongate and evenly cylindrical (Text-fig. 4).

Anterior half of mesoscutum very shiny, tending to be sharply and distinctly punctate. Costad abscissa of the basalis a little longer than in *fulvicrus* so that the discoidal cell is slightly more elongate; abscissa 1 of the radius slightly more obliquely placed than in *fulvicrus* and slightly more curved.

Ovipositor sheath as in *fulvicrus*.

♂. I associate with the female numerous males, caught in certain localities, with females, in England (Kent: Wye and Dartford Heath) and showing the same colouration.

Distribution: ENGLAND. FINLAND. SWEDEN. A common species; some seventy-five specimens examined.

Host: *Depressaria pallorella* Zeller (Oecophoridae). Host collected July; parasites emerge following May. In southern England, Mr. R. L. E. Ford has swept the species commonly from broom (*Cytisus*) in June.

Type in the Entomological Institute, Lund, Sweden. Examined.

*Microgaster curvicrus*, var. A. Three females from SWITZERLAND: Valais, Les Haudères and Ferpecle, vi and CZECHOSLOVAKIA: Tatra Mts., v. These females have the hind tibia blackened throughout; the apical segments of the flagellum are slightly more slender than in typical examples and slightly more bristly; the hairy part of the ovipositor sheath is slightly less than half as long as the hind tibia.

Superficially, *curvicrus* s.l. is much like *tibialis* but differs strikingly in the sculpture of the face.

### ***Microgaster erro* sp. n.**

(Text-figs. 3, 14)

♀. Extremely like *curvicrus* and differing from it by little more than the characters given in the key. The most obvious difference is the longer ovipositor of *erro* but the difference in the shape of the ocellar triangle may have equal importance.

Whereas in *curvicrus*, the apical infuscation of the hind tibia tends to spread over almost a third of the tibia, in *erro* it is restricted to the extreme apex but tends to be faint and in one of the three females from Semsjärvi is absent.

Flagellum not at all tapered apically. (Text-fig. 3). First abscissa of the radius slightly more curved than in *curvicrus*.

Length: larger than *curvicrus*, *c.* 6 mm. without ovipositor.

Type ♀. FINLAND: Lemland (*Hellén*), Helsinki Museum.

FINLAND: Bergö, 1 ♀, 17–28.vi.1946 (*Hellén*); Carelia, Semsjärvi, 3 ♀, 6.vi.1943 (*Hellén*); Helsingfors, 3 ♀ (*W. Nylander*). SWITZERLAND: Valais, Les Haudères, 4,000–8,000 ft., 3 ♀, vi.1935 (*J. E. & R. B. Benson*). The seven Finnish females are paratypes.

The three females from Switzerland are somewhat doubtful; they do not have the flagellar segments so bristly as in the type series. In one of them, the hind tibia is infuscate almost throughout; and in colour is thus exactly like var. A of *curvicrus*.

In *curvicrus* the ovipositor itself is strongly curved, rather thick and distinctly shorter than the hind tibia; in *erro*, it is longer than the hind tibia, less thick and less curved.

I have examined a female of what I believe to be this species from Cyprus; it differs from the Finnish specimens as follows: hind tibia without a trace of apical infuscation. Flagellum somewhat tapered apically, with the two preapical segments slightly longer, though this appearance may be deceptive for the segments are somewhat collapsed. Ocelli in a higher triangle, the posterior tangent to the anterior ocellus not cutting the posterior pair. Anterior part of the mesososcutum more shining and having altogether a much more polished appearance, the punctation being almost absent.

The combination of the above differences may constitute specific validity but needs to be seen in further specimens before a decision on this point can be reached.

### *Microgaster obsepiens* sp. n.

♀. Wings strongly darkened; stigma suffused with reddish on about basal third. All the femora red, except that the hind femur is faintly tipped with black; hind tibia also faintly darkened at tip and yellowish on about basal fifth. Basal half of ventral surface of gaster reddish yellow; a reddish yellow spot on each side of tergite 3.

Flagellum as in *curvicrus*, the apical segments tightly articulated and having an evenly cylindrical appearance; its pubescence so short as to be virtually not outstanding.

Front part of mesoscutum sharply and quite strongly punctate. Front femur slightly less thick and slightly longer than in both *curvicrus* and *fulvicrus*; inner spur of the hind tibia relatively a little shorter than in both *curvicrus* and *fulvicrus*, not more than two thirds as long as the hind basitarsus. Radius leaving stigma more obviously distal to middle than in both *fulvicrus* and *curvicrus*; first discoidal cell exactly as in *curvicrus*.

Ovipositor sheath slightly more than half as long as the hind tibia. Tergites with thin, pale apical margin.

Length: 5 mm. without ovipositor.

Type ♀. GERMANY: Berlin, Finkenburg (*Hellén*), Helsinki Museum.

In colour, this species approaches *procerus* more closely than it does either *fulvicrus* or *curvicrus* but differs from Ruthe's species in having very distinct punctation on both face and mesoscutum; the flagellum is also considerably shorter than in *procerus*.

### ***Microgaster opheltes*** **sp. n.**

♀. Hind femur red with dark tip; hind tibia also red with dark tip; middle femur with faint dark streak above.

Flagellum without bristly pubescence; preapical segment about one and one third times longer than wide.

Mesoscutum very shiny, even in front, and here with only a weak trace of punctation; much weaker than in both *curvicrus* and *fulvicrus*. Costal abscissa of the basalis between one third and one half as long as the mediad abscissa; first discoidal cell elongate, as in *curvicrus*; first abscissa of the radius virtually straight and leaving the rather broad stigma only very slightly beyond middle. Hind spurs whitish, the inner one not extending beyond basal two thirds of hind basitarsus.

Tergite 2 weakly sculptured (compared with most species of the genus), distinctly shorter than 3. Ovipositor sheath (hairy part) distinctly less than half as long as the hind tibia, *ca.* 3 : 7.

Length: *c.* 2·5 mm., without ovipositor; a small species.

Type ♀. Europe, YUGOSLAVIA: Macedonia, Lake Ochrid, 16.vi.1958 (*R. L. Coe*), B.M. (N.H.).

Paratype ♀. NORTHERN IRELAND: Co. Down, Cranfield Pt., 1.vii.1957 (*A. W. Stelfox*).

Size, colour and short ovipositor are the main features of this species. The usefulness of the other characters mentioned must be accepted with caution since they are based only on two specimens.

### ***Microgaster politus*** Marshall

(Text-fig. 26)

*Microgaster politus* Marshall, 1885 : 260.

♀. Legs predominantly brownish, the hind femur almost black. Wings more or less hyaline.

Face smooth-looking, almost polished and with only the merest trace of punctation. Preapical segment of flagellum about one and one third times longer than wide.

Mesoscutum highly polished. Suture between scutellum and mesoscutum reduced to a very narrow, foveolate groove. Hind spurs whitish, the inner one reaching only a little beyond the middle of the hind basitarsus. Fore wing (Text-fig. 26).

Ovipositor sheath nearly three quarters as long as the hind tibia.

♂. Like the female in colour and sculpture.

Length: ♂ ♀, *c.* 3 mm. without ovipositor of female.

Distribution: ENGLAND. IRELAND. SWEDEN. Not common.

Type in the B.M. (N.H.).

An easily recognized species. Apart from the polished second tergite, the short costad abscissa of the basalis is very characteristic.

## ***Microgaster deductor*** **sp. n.**

(Text-figs. 9, 29)

A highly aberrant species on account of its lobed claws (Text-fig. 9).

♀. Hind femur entirely red; middle femur dark beneath; hind tibia red throughout. Wings almost hyaline.

Head from in front rather narrowly triangular (Text-fig. 29). Pubescence of flagellum hardly noticeable; preapical segment about one and a quarter times longer than wide.

Mesoscutum densely punctate almost all over and coarsely rugose-punctate at the origin of the notaulic courses. Scutellum closely punctate along each side. Mesopleurum with large, conspicuous punctures almost everywhere.

Tergite 2 fully as long as 3. Tergites beyond 2 unusually densely and extensively hairy. Ovipositor sheath about three quarters as long as the hind tibia.

♂. Like the female but the palpi almost black and the middle femur more extensively blackened at base. The lobe of the claws is less well developed than in the female but will nevertheless distinguish this male from all others available for consideration in this synopsis.

Length: ♂ ♀, *c*. 5·2 mm. without ovipositor of female.

Type ♀. FINLAND, Ivalo (*Hellén*), Helsinki Museum.

Paratypes. Same data: 1 ♂, 1 ♀. LAPLAND: Tornekrask, 1 ♀.

In the Lapland female, the hind femur is darkened at base above and the middle and front femora are more extensively blackened at base than in the two Finnish females. The colour of the legs is likely to be variable.

An unmistakable species on account of the structure of the claws.

## ***Microgaster crassicornis*** Ruthe

(Text-figs. 1, 8)

*Microgaster crassicornis* Ruthe, 1860 : 124.

This species has been confused in the literature with some of the other species with equally red legs but because of its toothed claws *crassicornis* could actually be confused only with *areolaris*. The essential differences between the two species have been given in the key.

♀. The flagellum is more bristly than in any other species known to me and this, combined with the shortness of the apical segments, provides one of the most useful features for recognizing the species (Text-fig. 1).

Mesoscutum in front without punctation but there is considerable rugosity at the origin of the notaulic courses. Inner spur of the hind tibia hardly equal to two thirds the length of the hind basitarsus. Ovipositor sheath fully three quarters as long as the hind tibia.

Distribution: ENGLAND. FINLAND. SWEDEN. GERMANY 4 ♀.

Host: *Eupithecia denotata* Guenée (now *pimpinellata* Hübnagel) (Geometridae), England, Lyle Coll. in B.M. Bred from same host in Germany, Hinz Coll.

## ***Microgaster areolaris*** Thomson

*Microgaster areolaris* Thomson, 1895 : 2240.

♀. The legs are altogether darker than in *crassicornis*, the basal and apical infuscation of the hind femur being a conspicuous feature of all the specimens I have examined.

Flagellum considerably longer than in *crassicornis*. Face somewhat gabled along the middle; towards the antennal sockets, the keel is more prominent than in *crassicornis*.

Sculpture of tergite 2 very variable and on the whole very weak; in one of two Scottish examples, the surface is almost smooth; when clearly present, the sculpture is predominantly longitudinal.

Metacarp almost three times as long as its distance from the apex of the radial cell, a little longer than in *crassicornis*. Claws slightly weaker than in *crassicornis*.

♂. Ten males that I associate with this species (Poland, 8), (Switzerland, 2) have the claws toothed like the female; in all of them the middle femur is blackened and in the two specimens from Switzerland (Valais) the hind femur is almost entirely black.

Material examined: N. ENGLAND. FINLAND. SCOTLAND. SWEDEN. SWITZERLAND.

This is perhaps a Northern species.

## ***Microgaster consors* sp. n.**

(Text-fig. 23)

♀. Hind femur red with infuscation at base beneath (type) or entirely blackish; hind tibia without apical infuscation. Wings only faintly tinted, almost hyaline.

Flagellum not bristly; preapical segment almost square in outline.

Mesoscutum on the whole smooth-looking but finely rugose at the origin of the notaulic courses. Propodeum unusually finely and evenly rugose and with only a very weak, medial keel. Costad abscissa of the basalis short, not much more than one quarter as long as the mediad abscissa; stigma somewhat broad; metacarp fully three times as long as its distance from the apex of the radial cell (Text-fig. 23).

Hairy part of the ovipositor sheath fully three quarters as long as the hind tibia; apex of the ovipositor with two to three very small serrations, as seen from above.

Length: *c.* 3·8 mm. without ovipositor.

Type ♀. ENGLAND: S. Devon, Kingsteignton, Stark's Pond, 24.v.1942 (*J. F. Perkins*), B.M. (N.H.).

Paratypes. ENGLAND: Surrey, Byfleet, 1 ♀, 9–11.v.1947 (*R. B. Benson*); Herts., Brickett Wood, 1 ♀, 20.v.1936 (*R.B.B.*).

I associate with the females seven males, on the strength of wing and claw characters. These were all captured in May (England, Herts., Brickett Wood; Bucks., Farnham Common; Surrey, Wimbledon Common). With one exception (Brickett Wood) all have the hind femur infuscate throughout, that is, very dark brown.

This species is largely characterized by the shortness of the first abscissa of the discoideus, and long ovipositor sheath.

## ***Microgaster tibialis* Nees**

(Text-fig. 21)

*Microgaster tibialis* Nees, 1834 : 168.
*Microgaster pluto* Morley, 1936 : 211, **syn. n.**

♀. Rather small, very dark species with dusky reddish hind tibia, infuscated on about apical third; both middle and hind femur entirely black or blackish. Wings strongly smoky.

Antenna rather short, not bristly; preapical segment at most about one and a quarter times longer than wide.

Mesoscutum conspicuously punctate, the punctures tending to fade out at about posterior third. Scutellum with a few scattered punctures. Costad abscissa of the basalis between one third and one half as long as the mediad abscissa; first abscissa of the discoideus fully as long as the second; first abscissa of the radius leaving the stigma considerably distal to middle and very obliquely placed (Text-fig. 21).

N. W. EUROPE. Common.

Host: *Gracillaria tringipennella* Zeller (Gracillariidae); *Peronea aspersana* (Hübner) (Tortricidae).

In size and colour this species is much like *curvicrus* but easily separated by the sculpture of the face, among several other characters.

### ***Microgaster deprimator*** Fab.

(Text-figs. 6, 24)

*Ichneumon deprimator* Fab., 1798 : 227.
*Microgaster australis* Thomson, 1895 : 2240, **syn. n.**

♀. This large species is almost recognizable to the naked eye by its deeply infumated wings and strongly blackened hind tarsus, contrasting sharply with the intensely red hind femur. In one female (Switzerland, Müstertal, 1,400 m.) the hind femur is weakly infuscated at base; it is possible that more extensive darkening may occur in specimens taken at high altitudes.

Whole of median part of face with simple, though rather coarse punctation. Flagellum thick, markedly tapered apically; its pubescence so short as to be almost imperceptible; preapical segment from one and one third to one and a half times longer than wide.

Mesoscutum much less noticeably punctate than in *tibialis*. Mesopleurum, except for a small posterior area, closely punctate. Lateral keel of the propodeum very strongly raised behind so that the surface between it and the medial keel is almost concave.

♂. Claws pectinate like the female (Text-fig. 6). Colour usually similar but the hind tarsus often not contrastingly darkened. Propodeum equally characteristic.

Length: ♂ ♀, *c.* 5·5 mm. without ovipositor of female.

Distribution: CENTRAL EUROPE as far as SPAIN and TURKEY. CYPRUS. PERSIA. N. MONGOLIA (1 ♂). Thomson records *australis* from N. Italy, not N. Europe, as given by Fahringer (1937 : 334).

### ***Microgaster eupolis* sp. n.**

♀. Apart from the essential differences given in the key, this species may be compared with *deprimator* as follows:

Wings much less smoky. Distribution of light and dark leg-colouration much as in *deprimator*, except that the hind tarsus, especially in the type, is considerably reddened.

Surface immediately surrounding the ocelli considerably rugose; temples coarsely rugose in comparison with *deprimator*. Apical segment of antenna less narrowly conical but since only two females are available, this may have no significance.

Mesoscutum coarsely punctate; course of notaulices marked by a band of coarse rugose-punctation. Propodeum exactly as in *deprimator*. Hind coxa on lower half very closely, strongly punctate.

Length: *c.* 5·2 mm. without ovipositor.

Type ♀. AUSTRIA: Tyrol, Seiseralpe, 1893, Naturhistorisches Museum, Vienna.

Paratype. AUSTRIA: Innsbruck, Höttinger Berg, 1,700 m., 1 ♀, 20.viii.1950 (*Pechlauer*).

I associate with the above two females a single male from ITALY (Dolomiti, Passo Campolongo, 6.ix.1954 (*G. J. Kerrich*)). This has the characteristic mesoscutal sculpture of the females and the densely punctate hind coxa, but the punctures of the scutellum are smaller and hence more widely spaced; the punctation of the mesopleurum is equally strong and conspicuous but the interspaces show hardly a trace of surface sculpture.

## ***Microgaster epagoges*** Gahan

*Microgaster epagoges* Gahan, 1917 : 197.

♀. Flagellum fulvous throughout but darker above. Hind femur red with faint apical infuscation. Basal half of ventral surface of gaster yellowish.

Flagellum not bristly; preapical segment about one and one third times longer than wide.

Mesoscutum not punctate in front but considerably roughened, the sculpture still stronger at the origin of the notaulic courses. Hind claw with three to four spine-like teeth.

Sculpture of tergites 1 and 2 particularly coarse; 3 also considerably sculptured. Hypopygium thin, membranous, yellowish and with numerous lateral creases.

Length: *c.* 3·5 mm. without ovipositor.

Material examined: U.S.A., Tennessee, Nashville, 1 ♀ paratype, in B.M. (N.H.).

Host: *Epagoge sulfureana* Clemens (Tortricidae).

I cannot be sure that this species, represented by the single paratype in the British Museum, is really distinct from *Microgaster phthorimaeae*, as represented by a single female in the B.M.(N.H.), determined by Muesebeck and evidently one of three specimens recorded by him (1922 : 41) from California, Pasadena but not part of the type series. These three examples of *phthorimaeae* were bred from *Phthorimaea operculella* Zeller.

Apart from slight differences in colour—the broken flagellum of *phthorimaeae* is pale only beneath—I can find no differences of particular significance. Certainly there is a short keel beneath the antennal insertions in *epagoges*, as specially mentioned by Muesebeck and only the merest trace of one in the single specimen of *phthorimaeae* but in my opinion this is a feature of only doubtful specific value.

## ***Microgaster phthorimaeae*** Muesebeck

*Microgaster phthorimaeae* Muesebeck, 1922 : 40.

See discussion under *epagoges*. Not included in key because not sufficiently differentiated from *epagoges* on the material available to me in the B.M. (N.H.).

Distribution: U.S.A., California, Oxnard (type locality); Pasadena, 1 ♀ paratype, in B.M. (N.H.).

Host: *Phlyctaenia ferrugalis* Hübner (Pyralidae), host of type series; *Phthorimaea operculella* Zeller (Gelechiidae).

## ***Microgaster novicius*** Marshall

*Microgaster novicius* Marshall, 1885 : 252.
*Microgaster swammerdamiae* Muesebeck, 1922 : 37, **syn. n.**

♀. This is a small species, characterized essentially by three features: long, thin antenna with bristly flagellum; very short costad abscissa of the basalis and very short ovipositor.

The pale parts of the legs are yellow rather than red; hind spurs whitish; hind femur faintly darkened at tip above.

Metacarp almost four times as long as its distance from the apex of the radial cell.

Ovipositor sheath only about one third as long as the hind tibia. Hypopygium rather heavily sclerotized but still tightly folded along the middle line in death and without lateral creases.

Length: *c.* 3 mm. without ovipositor.

Distribution: SCOTLAND (Lanark, Cadder) (type in B.M.(N.H.)). FINLAND, Kempele, 1 ♀, Flütis, 1 ♀ (hind femur of this female entirely infuscate and fine rugosity of the notaulic courses extending further backwards than in other females). NORTH AMERICA (♀, paratype of *swammerdamiae*, in B.M.(N.H.)).

Host: *Swammerdamia castanea* Busk (Hyponomeutidae), host of type series of *swammerdamiae* in North America.

## ***Microgaster grandis*** Thomson

(Text-figs. 11, 28)

*Microgaster grandis* Thomson, 1895 : 2242.

♀. Hind femur varying from entirely red to entirely black.

Flagellum long, markedly tapering to apex; preapical segment fully twice as long as wide.

Hairs of the median cell sparse, becoming still sparser to widely absent along the medius side of the cell; radius leaving stigma very obviously beyond middle; stigma rather narrow (Text-fig. 28); costad abscissa of the basalis fully half as long as the mediad abscissa.

Hairy part of the ovipositor sheath about one third as long as the hind tibia.

♂. Like the female in hairiness and punctation of mesoscutum. The median cell shows the same sparseness of hairs.

Length: ♂ ♀, 4·5 mm. without ovipositor of female.

Distribution: ENGLAND. FINLAND. IRELAND. SWEDEN.

Host: *Cnephasia chrysanthemana* Duponchel (Tortricidae), 1 ♀, England, Kent, Bexley, collected May, emerged June same year (*R. L. E. Ford*). *Aphelia viburniana* Fab. (Tortricidae), 1 ♀, England, Yorks., Ling Hill, emerged 2.vii.1965 (*J. Bradley*); the hind femur of this female is entirely black.

This is one of the more distinct species, characterized largely by the long hairs and very characteristic punctation of the mesoscutum.

## ***Microgaster acilius*** **sp. n.**

♀. Has a hypopygium similar to that of *grandis*, with which, in addition to the characters given in the key, it may be compared as follows:

Hind femur red, except for faint infuscation at extreme tip.

Upper surface of the head with more rugosity.

The coarse rugosity at the origin of the notaulic courses extends almost to middle of disc; similar rugosity occurs along the middle line in front so that the mesoscutum anteriorly has a strongly rugose appearance but along the middle of the lateral lobes the surface tends to be much smoother. Costad abscissa of the basalis slightly shorter; first discoidal cell slightly less elongate; metacarp very slightly shorter, about one and two thirds times longer than its distance from the apex of the radial cell; median cell showing an even distribution of setae. Inner spur of the hind tibia slightly shorter, not more than two thirds as long as the hind basitarsus.

Gaster slightly narrower. Tergite 2 a little longer than 3. Seen in profile, the postero-dorsal edge of the hypopygium is deeply sinuate; this is more obvious than in *grandis*.

Length: *c.* 3·5 mm. without ovipositor.

Type ♀. ENGLAND: Kent, Wye Downs, 2.vi.1949 (*R. L. E. Ford*), B.M. (N.H.).

Paratypes. Same data: 1 ♀, 8.vii.1946 (*G. E. J. Nixon*). Kent, Dartford Heath, 2 ♀, 16.ix.1960 (*R. L. E. Ford*); Dulwich, 2 ♀, 24.viii.1885 (*Billups*).

Mr. Ford has taken a series of nine males with the two females from Dartford Heath that I think may well belong to this species; they show the same strong rugosity of the anterior part of the mesoscutum a similarly short metacarp and similarly coloured legs. The association, however, must be regarded as circumstantial for I am unable to define the male clearly in relation to the males of other species.

In general facies, the female bears a striking resemblance to *sticticus*, differing from it by hardly more than the degree of sclerotization of the hypopygium, the arrangement of bristles at the apex of the ovipositor sheath and the longer flagellar segments.

## ***Microgaster brittoni*** Viereck

*Microgaster* (*Microgaster*) *brittoni* Viereck, 1916 : 202.
*Microgaster brittoni* Viereck; Muesebeck, 1922 : 36.

Through the courtesy of Dr. Muesebeck, I have been able to examine a male and two females of this species, all determined by him.

♀. Apart from differing from *acilius* in its extensively yellow-marked gaster, *brittoni* is extremely like that species.

The front part of the mesoscutum is more evenly and more evidently rugose than in *acilius*. First discoidal cell more elongate, as in *grandis*. Hind femur narrow and very evenly widened towards apex. Tergite 1 appears shorter than in *acilius* and is more abruptly and strongly widened towards apex. Ovipositor sheath distinctly longer.

♂. In colour and in sculpture of mesoscutum like the female. Beyond this there is nothing useful I can say about this specimen. Dr. Muesebeck assures me that it is an excellent match of Viereck's type.

Material examined: U.S.A., Mass., Holliston, 1 ♀. Michigan, Tuscola, 1 ♂. CANADA: Toronto, 1 ♀.

This species, together with *grandis* and *acilius* form a small species-group within the larger aggregate, characterized by the long, somewhat tapering flagellum, with its very elongate preapical segment, the evenly sclerotized hypopygium and the differentiated tuft of bristles at the apex of the ovipositor sheath. This tuft is not too readily seen in the two females of *brittoni* but is more distinct in the specimen from Holliston.

### *Microgaster deceptor* sp. n.

(Text-figs. 10, 19, 20)

An aberrant species on account of large claws and heavily sculptured thorax.

♀. All femora and all tibiae entirely reddish yellow. Basal half of gaster beneath yellowish; gaster otherwise, except for the black first and second segments, dark brown.

Head from above strongly narrowed behind the eyes (Text-fig. 19). Temples almost coarsely rugose; traces of rugose-punctation immediately behind the ocelli. Flagellum thin, the preapical segment about one and a half times longer than wide. Ocelli in a higher triangle than in the other species in this synopsis except *auriculatus*.

Costad abscissa of the basalis fully two thirds as long as the mediad abscissa; areolet somewhat characteristic in shape (Text-fig. 20). Apical tarsal segments of all legs somewhat enlarged (Text-fig. 10). Propodeum with a longer, more clearly differentiated, dorsal surface than in the other species of the genus, somewhat dull looking, densely intricately rugose; the posterior corners rather strongly produced backwards.

Tergite 2 three times as wide as long and markedly longer than 3; tergite 3 with a group of large punctures towards sides. Widened, hairy part of ovipositor sheath a little less than half as long as the hind tibia. Hypopygium in type shows no lateral creasing but is tightly folded along the middle line; in paratype distinct creasing is visible.

Length: 4 mm. without ovipositor.

Type ♀. FINLAND: Juuga (*Woldstedt*), Helsinki Museum.

Paratype. Same data: 1 ♀.

Apart from its long claws, this species has the mesoscutum more heavily sculptured than in any other species, excepting the *russatus*-group (but cf. *auriculatus*) On structure of propodeum, enlargement of apical tarsal segment and lengthening of tergite 2, this species and *auriculatus* are transitional towards *russatus* and *rugulosus*, the two species that formerly constituted the genus *Hygroplitis*, now treated as a synonym of *Microgaster* (Muesebeck & Walkley, 1951 : 135, Nixon, 1965 : 267).

### *Microgaster auriculatus* Fab.

(Text-fig. 12)

*Ichneumon auriculatus* Fab., 1804 : 69.
*Microgaster auriculatus* Fab.; Spinola, 1808 : 147.

A most distinctive species, characterized by the pale-marked gaster, short ovipositor and especially by the long claws. On claw-length different from typical species of *Microgaster* with the exception of *deceptor* to which it appears to be closely related and with which it may be compared as follows:

♀. Hind coxa entirely reddish yellow; (hind tibia missing); Scape reddish yellow on basal half; flagellum pale. Tergite 1 suffused with reddish; 2 still paler; 3 reddish yellow; a wedge-shaped mark of the same colour extending along the middle of the following three tergites.

Head from above less exaggerated in appearance, less narrowed behind the eyes (cf. Text-fig. 19). Ocelli in a high triangle as in *deceptor*. Flagellum thin as in *deceptor* but broken in the single specimen available; twelve antennal segments present on left side.

Mesoscutum less rugose. Front part of mesopleurum without the dense punctation characteristic of *deceptor* but nevertheless with coarse rugosity within the prepectal area. Claws thinner, slightly longer and more evenly curved; apical tarsal segment of all legs less obviously enlarged. Areolet of the fore wing not characteristic in shape.

The pale honey-yellow hypopygium is more evenly sclerotized than in *deceptor* and is without a trace of lateral creasing. Ovipositor sheath as in *deceptor*.

Material examined: GERMANY: 1 ♀, labelled " Fürstenberg i.M. Konow ", " auriculatus F. Coll. Marshall " and " Microgaster auriculatus F. det Szepligeti ". This specimen received on loan from the Hungarian Natural History Museum.

*M. auriculatus* and *M. deceptor* clearly represent a small species-group within *Microgaster*, characterized essentially by the long claws.

## ***Microgaster subcompletus*** Nees

*Microgaster subcompletus* Nees, 1934 : 165.
*Microgaster carinata* Packard, 1880 : 25, Muesebeck, 1922 : 38, **syn. n.**

♀. Scape and flagellum pale beneath. Pale parts of the legs somewhat yellowish; front and middle femora entirely pale. Basal half of ventral surface of gaster yellowish.

Mesoscutum without punctation in front but rugose at the origin of the notaulic courses; the rugosity sometimes extending almost to middle of disc. Mesopleurum in front strongly shining and with only minute setiferous punctures.

Ovipositor evenly but weakly curved and rather thick.

N.W. EUROPE. NORTH AMERICA, ? Mass. (*carinata*). According to Muesebeck, in litt., *carinata* may not be native to North America.

Host: *Pyramis atalanta* Linn., (Nymphalidae), in Europe and North America. *Notarcha ruralis* Scopoli (Pyralidae), Europe in B.M. (N.H.). Both hosts live concealed in folded or rolled leaves of nettle (*Urtica*).

This, the only gregarious species of *Microgaster* known to me, is easily recognized by its long, thick ovipositor, thin, bristly antenna and black-tipped hind femur and hind tibia.

Dr. Muesebeck has confirmed that *carinata* falls as a synonym of *subcompletus*.

## ***Microgaster laeviscuta*** Thomson

(Text-figs. 7, 30)

*Microgaster laeviscuta* Thomson, 1895 : 2239.

This is one of a small group of species previously confused by older writers under the name " *globatus* Nees ".

♀. All the femora and tibiae red; hind tarsus almost as red as its tibia; hind spurs as red as their tibia.

Flagellum somewhat thick, not bristly, usually pale beneath and with the two preapical segments obviously longer than wide. The two apical segments of the maxillary palpi rather short.

Mesoscutum considerably roughened in front but without obvious punctation. Front part of the mesopleurum shiny, at most finely rugose. Spines of the outer side of the hind tibia pale and short, the thicker ones along upper edge of tibia clearly a little shorter than the finer spines on the lower side; inner spur of the hind tibia rather short in relation to the outer one and not reaching beyond basal two thirds of the hind basitarsus (Text-fig 7). First abscissa of the radius very obliquely placed on the stigma (Text-fig. 30).

Ovipositor thick, forming an even curve; the straight line joining its extremities equal to the length of the hind tibia.

Length: *c.* 4 mm. without ovipositor.

CZECHOSLOVAKIA. ENGLAND. FINLAND. SWEDEN.

Type in the University Museum, Lund, Sweden. Examined.

Host: *Argyroploce dimidiana* Sodoffsky (Eucosmidae) (in England); *Acrobasis tumidana* Schiffermüller (Crambidae) (in Czechoslovakia); *Tortrix viridana* L. (Tortricidae) (in Czechoslovakia).

Very important for the recognition of this species is the shortness of the inner spur of the hind tibia (not an easy feature to appreciate!), and the thick, evenly curved ovipositor.

### ***Microgaster hospes*** Marshall

(Text-fig. 17)

*Microgaster hospes* Marshall, 1885 : 257.
*Microgaster comptanae* Viereck, 1911 : 403, **syn. n.**

♀. Very close to *laeviscuta* but smaller and differing from it only in a few details; these are mainly concerned with colour.

All the femora clouded with infuscation at least basally; sometimes the hind femur entirely blackish; in palest specimens the middle femur always shows a dark streak above.

Flagellum rather short, a little shorter than in *laeviscuta* but the preapical segment at least very slightly longer than wide.

Inner spur of the hind tibia slightly longer in relation to the length of the outer one and to the length of the hind basitarsus. First abscissa of the radius very slightly less curved than in *laeviscuta* (cf. Text-fig. 30).

Hairy part of the ovipositor sheath shorter than in *laeviscuta*, not more than half as long as the hind tibia.

Length: 3–3·2 mm. without ovipositor.

Distribution: N.W. EUROPE. NORTH AMERICA (*comptanae*).

Type in the B.M.(N.H.).

Host: *Peronea hastiana* L., *Depressaria aspersana* Hübner (Tortricidae). Bred from both these hosts in England by *R. L. E. Ford.* Parasite overwinters in cocoon and emerges in May and June. *Ancylis comptana* Fröhlich (Tortricidae) in North America, host of *comptanae.*

I sent specimens of *hospes* to Dr. Muesebeck for comparison with Viereck's type of *comptanae* and he has confirmed that they are the same species.

The hind tibia of *hospes* has the same subtly distinctive appearance as that of *laeviscuta*, all the spines being just as short and pale golden in colour.

I am not satisfied that I have clearly recognized the specific limits of *hospes*; it is a species needing further study.

### ***Microgaster peroneae*** Walley

*Microgaster peroneae* Walley, 1935 : 56.

This is a species with only a minute black spine at the base of the claws.

♀. Flagellum a little pale beneath. Hind femur bright yellowish rather than reddish with only a faint touch of infuscation at tip; hind tibia with weak infuscation at extreme apex; hind tarsus about as dark as the apex of the hind tibia but the hind basitarsus whitish at base.

Maxillary palpi somewhat short, in comparison with, say, *leechi*, bright yellow. Temples considerably rugose. Antenna rather thin; flagellum slightly bristly, the preapical segment fully one and one third times longer than wide; the segment proximal to this still longer. Face evenly dull, confusedly rugulose.

Anterior part of the mesoscutum considerably roughened, the lines of the notaulices markedly rugose as far as about middle. Anterior part of mesopleurum shiny and with large, but very ill defined punctures. Inner spur of the hind tibia three fifths as long as the hind basitarsus; hind coxa on outer side more evenly and more closely punctate than in *hospes*. Medial groove of mesosternum wide enough to show its costae; this groove is narrower in *hospes*.

In one female, a paratype, tergite 3 is as rugose as 2; in the other two females, this tergite, though still markedly rugose, is much less so than tergite 2. Hypopygium large, tightly folded along the middle line in the dead insect and with numerous lateral creases. Hairy part of the ovipositor sheath almost two thirds as long as the hind tibia.

Material examined: CANADA: N.S., Grand River, 1 ♀ paratype, received for B.M. (N.H.) through the courtesy of W. M. Mason. Ontario, Biscotasing, 1 ♀, ex *P. variana*. British Columbia, Creston, 1 ♀, ex *Acleris variana* on Cranberry.

Host: *Peronea variana* Fernald (now *Acleris v.*) (Tortricidae).

There is very little of substance to separate this species from *hospes*, beyond colour and the slightly longer ovipositor of *peroneae*. It is possible that the hypopygium of *peroneae* is larger than that of *hospes* but the difference is difficult to assess with only two females of *peroneae* available.

### ***Microgaster ductilis* sp. n.**

(Text-fig. 18)

♀. Dark species; hind femur blackish; hind tibia showing a dark reddish infuscation that deepens distal to middle; hind tarsus infuscate, as dark as the apical part of the hind tibia; hind spurs contrasting pale yellow. Wings strongly infumated.

Flagellum thin, bristly; preapical segment only very slightly longer than wide.

Anterior part of the mesopleurum very shiny, with very shallow but more or less discrete punctation. Metacarp fully three times as long as its distance from the apex of the radial cell; costad abscissa of the basalis fully one third as long as the mediad abscissa. Inner spur of the hind tibia three quarters as long as the hind basitarsus.

Ovipositor sheath with unusually long, thin, basal stalk; hairy part of sheath about two thirds as long as the hind tibia; ovipositor slightly but evenly curved throughout.

Length: 4 mm. without ovipositor.

Type ♀. FINLAND: Siikajoki (*Wuorentaus*), Helsinki Museum.

Paratypes. FINLAND: Aitlolahti, 1 ♀, vii.; Kyolimaj, 1 ♀; Kangasala, 1 ♀, vii.

This dark-legged species is essentially characterized by the bristly flagellum and the long hypopygium.

## *Microgaster famulus* sp. n.

♀. This species is superficially extremely like *tibialis*, differing from it as follows:

In four out of six females, the hind femur is predominantly red with considerable apical infuscation. Wings as dark as in *tibialis*.

Flagellum slightly longer and slightly bristly.

Front part of the mesoscutum less clearly punctate. Front part of mesopleurum rather coarsely rugose; the same area in *tibialis* shows well defined, discrete punctures. Metacarp longer, about twice as long as its distance from the apex of the radial cell. Claws less bent and without spines.

Ovipositor sheath, seen from above, with many more outstanding bristles.

Type ♀. AUSTRIA: Loitsch-Krain, vii–viii (*Graeffe Coll.*). Naturhistorisches Museum, Vienna.

Paratypes. AUSTRIA: Steiermark, Tratten b. Murau, 2 ♀, ix.; Feistritz i.d. Wochein, 1 ♀.

The face of this species is very shiny and has rather ill defined pits along the middle line. This is an observable difference, compared with *tibialis*, but it may have little significance. In spite of the differences given above, the specific validity of *famulus* should be accepted with some caution.

## *Microgaster sticticus* Ruthe

(Text-figs. 2, 33)

*Microgaster sticticus* Ruthe, 1858 : 5.

This species closely resembles *acilius* in general facies but there is a fundamental difference between the two species in the sclerotization of the hypopygium; that of *sticticus*, though short, is tightly folded along the middle line and laterally usually shows one or more creases in death.

♀. Legs, excluding the coxae, red; rarely the middle femur with a short, dark streak above at base. Wings faintly, and virtually evenly, brownish.

Head rather deeply emarginate behind. Space between the eye-margin and the ocelli transversely striate. Flagellum not bristly (Text-fig. 2).

Mesoscutum conspicuously rugose in front, the sculpture coarser along the course of the notaulices. Front part of the mesopleurum strongly shining, very superficially punctate. Propodeum rather evenly rounded from back to front; its sculpture fine and close for the genus; medial keel, and lateral keel behind, weak. As in *acilius*, the radius leaves the stigma markedly distal to middle. Inner spur of the hind tibia about three quarters as long as the hind basitarsus.

Gaster decidedly elongate (Text-fig. 33).

Length: *c.* 3·8 mm. without ovipositor. A medium sized species of slender build.

N.W. EUROPE. Common.

This species could be confused with the similarly coloured *laeviscuta*; the latter, however, has the head more transverse, the second segment of the gaster more transverse, the inner spur of the hind tibia relatively shorter and the ovipositor sheaths longer.

### *Microgaster alebion* sp. n.

I regard this species, provisionally, as being composed of two generations—a spring form emerging from larvae of *Platyptilia* and a summer one parasitizing various lepidoptera feeding on nettle (*Urtica*). These two generations are separable on a small difference in the length of the ovipositor but by no other criteria that I believe to have specific validity. It is the spring generation from *Platyptilia* to which I give the name " alebion ".

♀. The two basal sternites usually extensively yellow; in such individuals, the femora are entirely red; in one out of two bred females from Boxhill, the middle femur shows faint darkening at base above; hind tibia without apical infuscation; hind tarsal segments becoming infuscated towards apex, but generally as reddish as tibia. Fore wing almost hyaline.

Head above with a considerable amount of rugosity; between the ocelli and the eye-margin there is always at least a trace of striation. Distance between a posterior ocellus and the front ocellus distinctly less than the diameter of the anterior ocellus. Flagellum not bristly, the preapical segment hardly one and one third times longer than wide.

Mesoscutum very strongly rugose in front, the coarse, wrinkly rugosity extending backwards along the course of the notaulices almost to middle; the sculpture much stronger than in the very similar *laeviscuta*. Front part of the mesopleurum quite strongly rugose-punctate. Hind tibia slightly less thick than in *laeviscuta*, the spines of its outer surface having a very prickly appearance, being long, sharply pointed and more upstanding than in *laeviscuta*; inner spur of the hind tibia about three quarters as long as the hind basitarsus, much longer in proportion to the outer spur than in *laeviscuta*. Costad abscissa of the basalis rather short, hardly more than one third as long as the mediad abscissa.

Ovipositor sheath about three quarters as long as the hind tibia.

Length: *ca.* 4 mm. without ovipositor.

Type ♀. ENGLAND: Kent, Gravesend, collected 1.vi.1950, emerged 16.vi.1950, ex *Platyptilia gonodactyla* (*R. L. E. Ford*), B.M. (N.H.).

Paratypes (females only). Same data as type, 3 ♀, 4 ♂; 1 ♀, 1 ♂, 10.vi.1951. England: Kent, Polhill, 3 ♀, 1 ♂, 12.vi.1952; Surrey, Boxhill, 2 ♀, 3 ♂, v.1951; 3 ♀, 2 ♂, 1.vi.1959. All the foregoing bred by *R. L. E. Ford* from *P. gonodactyla*. Surrey, Redhill, 1 ♀, 9.vi.1934, ex *P. gonodactyla* (*W. Rait-Smith*). Herts., Gade Valley, 1 ♀, 23.vi.1936 (*R. B. Benson*).

Host: *Platyptilia gonodactyla* Schiffermüller (Pterophoridae) on *Tussilago farfara* L., (Coltsfoot).

### *Microgaster alebion*, var. A

♀. Differs from the nominate form only in the length of the ovipositor, the sheaths being two thirds as long as the hind tibia.

ENGLAND: Hants, Stockbridge, 1 ♀, 1 ♂, vii. ex *Vanessa atalanta*. Kent, Bexley, 1 ♀, 1 ♂, collected 6.vii.1938, emerged 1.viii.1938, ex *Vanessa atalanta* (*R. L. E. Ford*); 8 ♀, 3 ♂, vii.1943, ex *Choreutis myllerana* (*R.L.E.F.*). Surrey, Esher, 2 ♀, 1 ♂, collected 12.vi.1947, emerged 30.vi.1947, ex *Notarcha ruralis* (*G. E. J. Nixon*);

Wimbledon Common, 1 ♀, 20.v.1947, ex *N. ruralis*; Redhill, 1 ♀, 14.viii.1947, ex *Simaethis fabriciana*. Sussex, Hailsham, 1 ♀, vii, ex *N. ruralis*.

Host: *Choreutis myllerana* Fabr., *Notarcha ruralis* Scopoli, *Simaethis fabriciana* L. These three hosts, like *Platyptilia gonodactyla*, the host of the nominate form, are all Pyralidae. *Vanessa atalanta* L. (Nymphalidae). Since this host, like the others of var. A., lives in a rolled or folded leaf of *Urtica* (Nettle), the possibility of misidentification of host cannot be ruled out here.

*Platyptilia gonodactyla* lays its eggs in September on *Tussilago* so that the early stages are available for *alebion*, var. A. after its cycle on the *Urtica*-feeding hosts.

I have examined a series of seven females from various localities in Finland, that resemble var. A. in the shortness of the ovipositor sheaths but show considerable leg darkening. In all these specimens both hind femur and hind tibia show well defined apical infuscation and in some individuals, the hind femur shows also a patch of basal infuscation.

## ***Microgaster parvistriga*** Thomson

*Microgaster parvistriga* Thomson, 1895 : 2241.

♀. All the femora reddish yellow. Wings almost hyaline.

Face rather finely rugulose-aciculate, lacking the somewhat coarse punctate element seen in the facial sculpture of *hospes*. Vertex between the ocelli and the eye-margin without transverse striation; immediately behind and between the ocelli, the surface virtually smooth and highly polished. Flagellum rather short, not bristly; the two preapical segments about one and a quarter times longer than wide.

Mesoscutum with a polished, smooth appearance in English specimens, the weak sculpture at the origin of the notaulic courses hardly spreading backwards onto the disc; in a large individual from Germany, Berlin (Ruthe Coll. in B.M. (N.H.)), the front part of the mesoscutum shows more rugosity than in the English material. Costad abscissa of the basalis not more than one third as long as the mediad abscissa, that is, relatively shorter than in *hospes*.

Tergites 1 and 2 rather weakly sculptured compared with *hospes* and *laeviscuta*, the surface having a smoothed-out appearance.

England. Germany. Sweden.

Host: A series in the B.M. (N.H.) was bred in August, 1945, from catkins of *Betula* found in March of the same year.

The determinative feature for recognizing this species is the shape of the ovipositor. When this is concealed within its sheaths, the species could easily be confused with palest forms of *hospes* and smallish examples of *laeviscuta*. From the latter, *parvistriga* differs in having the first abscissa of the radius much less obliquely placed (cf. Text-fig. 30) and from *hospes* in having tergites 1 and 2 more finely sculptured.

## ***Microgaster caris* sp. n.**

(Text-fig. 22)

♀. A brightly coloured species. The pale parts of the legs are more yellowish than reddish; the hind spurs are whitish and contrast strongly with the deeply infuscated apex of the hind tibia and the equally infuscated hind tarsus.

Maxillary palpus pale yellow. Wings only faintly and evenly darkened.

Head considerably roughened above; traces of transverse striation between the eye-margin and the ocelli and at temples. Flagellum thin, bristly, with the underside markedly paler; antennal segment 16 fully one and a half times longer than wide.

Mesoscutum densely sculptured at least to middle, the sculpture having a somewhat shrivelled appearance.

Tergites 1 and 2 as densely sculptured as in the majority of the species. Tergite 2 distinctly longer than 3; tergite 3 with pale apical margin. Ovipositor sheaths about three fifths as long as the hind tibia.

Length: *c.* 3·5 mm. without ovipositor.

Type ♀. AUSTRIA: N. Tyrol, Salvenburg (*Kohl*), Naturhistorisches Museum, Vienna.

Same data: 1 ♂. AUSTRIA: Jitter, 1 ♀ (*Kohl*).

The single male that I associate with the female has the underside of the flagellum almost yellow. The sculpture of the mesoscutum is a little less extensive but the venational details and the colour of the legs are the same.

## *Microgaster asramenes* sp. n.

♀. This species has been largely characterized by the details given in the key; there is little to add.

Wings faintly darkened, the colour deeper apically; a dark band envelopes the first abscissa of the radius and this contrasts with a large, pale area occupying almost proximal half of radial cell. Scape almost entirely reddish; flagellum brown, paler beneath. Basal half of gaster beneath, yellowish.

Sculpture of face decidedly fine. Flagellum somewhat bristly, tapering apically; the preapical segment fully one and a half times longer than wide. Distance between a posterior ocellus and the anterior ocellus equal to about half the diameter of the anterior ocellus; posterior ocellus separated from eye-margin by about one and two thirds its diameter. Vertex between and around the ocelli highly polished.

Inner spur of the hind tibia fully four fifths as long as the hind basitarsus. Submediellan cell of the hind wing entirely free from hairs.

Tergite 2 as long as 3. Hairy part of the ovipositor sheath fully two thirds as long as the hind tibia.

Length: *c.* 4·5 mm. without ovipositor.

♂. Flagellum strongly tapered, the thick, basal segments somewhat flattened; the entire flagellum almost yellow beneath. Tergites 1 and 2 more extensively smooth and polished medially than in the female.

Type ♀. TURKEY: Cayeli, 50 ft., 22.viii.1959 (*K. M. Guichard*), B.M. (N.H.). Taken in *Alnus* plantation near stream.

Paratypes. ITALY: Napoli, 2 ♂, 15.viii.1953.

## *Microgaster pantographae* Muesebeck

*Microgaster pantographae* Muesebeck, 1922 : 34.

♀. Front and middle coxae, except at base, pale yellow; trochanters of all legs and front and middle tibiae pale yellow; hind femur yellowish, faintly infuscate at extreme apex; the blackened hind tarsal segments are faintly annulated with white at base. Scape and flagellum brown, both paler beneath. Wings faintly and more less evenly darkened (England); virtually hyaline in paratype from U.S.A.

Antenna somewhat tapering to apex; with segment 16 fully one and a half times longer than wide; flagellum somewhat bristly. Distance between a posterior ocellus and the anterior ocellus about half the diameter of the anterior ocellus; posterior ocellus separated from the eye-margin by about one and two thirds its own diameter.

Submedian cell of the hind wing with scattered, colourless hairs.

Tergite 2 very distinctly longer than 3, very coarsely reticulate-rugose; tergite 3 almost as strongly rugose over at least basal half. Hairy part of the ovipositor sheath about two thirds as long as the hind tibia; ovipositor itself evenly curved throughout.

Length: *c.* 4·5 mm. without ovipositor.

Distribution: U.S.A., Maine, Bangor (type locality). Various other localities recorded by Muesebeck. ENGLAND: Surrey, Horsley, 12.vi.1957, 1 ♀ (*J. F. Perkins*), in B.M. (N.H.).

Host: According to Muesebeck, *pantographae* described from the linden-leaf roller, *Pantographa lineata* Grote and Robinson (Pyralidae). Same author also gives *Gelechia cercerisella* Chambers (Gelechiidae) as another host.

In the English female the hind tibia is strongly infuscated on about apical third; the middle part of the tibia is almost reddish and the basal fifth is yellowish; in the American examples (paratype and one other female examined), this contrast in colour is much less well marked, the apex of the hind tibia being only weakly infuscate.

This species is readily distinguished from all other N.W. European species by its predominantly yellow-marked hind coxa.

## *Microgaster phryne* sp. n.

(Text-fig. 32)

♀. Front and middle legs distal to coxae entirely pale reddish yellow; hind tibia with darkened tip and hind tarsus infuscate more or less throughout. Wings almost hyaline.

Face finely rugose and with no obvious punctate element (Text-fig. 32). Temples considerably roughened. Flagellum thin; preapical segment about one and a third times longer than wide.

Mesoscutum somewhat dull and rugulose almost all over though the sculpture fades out and the surface becomes more shiny towards back. Costad abscissa of the basalis from one thrid to nearly one half as long as the mediad abscissa; stigma short, somewhat broad. Claws simple.

Tergite 2 weakly sculptured, sometimes almost smooth. Hypopygium more or less evenly sclerotized, without lateral creases. Ovipositor sheaths very short, narrow, about as wide as the hind basitarsus; hairy part of sheath about two fifths as long as the hind tibia. Ovipositor rather thin, weakly downcurved at apex.

♂. Like the female in colour and sculpture but the eyes slightly less convergent.

Length: ♂ ♀, *c.* 2·3 mm. without ovipositor of female.

Type ♀. EUROPE: Yugoslavia, Macedonia, Prespa Geul, 22.vi.1958, verge of oak-wood (*R. L. Coe*), B.M. (N.H.).

Paratypes. Same data: 4 ♀, 2 ♂.

This unusually small species is a typical *Microgaster.* It differs from all other species in having convergent eyes. This character will separate it from *opheltes*, to which it otherwise bears a very close resemblance.

## ***Microgaster fischeri*** Papp

*Microgaster fischeri* Papp, 1960 : 120

My knowledge of this little species is based on two male paratypes kindly lent to me by Dr. Max Fischer of the Naturhistorisches Museum, Vienna.

The species was described from the neighbourhood of Vienna and, being based unfortunately on the male sex only, is difficult to interpret. Nevertheless, there are, in the B.M. (N.H.), two females and one male, from England, all of which agree with the paratypes in size, colour and sculpture. It is on the characters of the two females that I am interpreting the species and finding a place for it in the synopsis.

♂ ♀. Wings considerably, evenly, darkened. Middle and hind femur entirely blackish in the three English examples; in one of the paratypes, the middle femur is flushed with reddish along outer side in apical half; hind tibia brownish red, gradually becoming darker in about apical third.

♀. Face finely rugose, without a punctate element, much as in *phryne*. Flagellum somewhat thin, with the preapical segment about one and a third times longer than wide, exactly as in *phryne*. Eyes not at all convergent.

Mesoscutum considerably rugulose in front half in the two paratypes; less so in the English examples; the sculpture virtually not distinguishable from that of *phryne*. Propodeum with hardly an indication of a medial keel; it is sharply defined in *phryne*.

In the paratypes, tergite 3 is sculptured over basal half; in the English examples, this segment is smooth, though not as polished as in *phyrne*. Ovipositor sheath as short as in *phryne* but wider; ovipositor slightly thicker, evenly curved throughout.

Length: ♂ ♀, *c.* 2·3 mm. without ovipositor of female.

AUSTRIA: Vienna (type locality). ENGLAND: Bucks., Princes Risborough, 1 ♀, 21.vi–4.vii.1942; Aston Clinton, 1 ♂, 6.vi.1953; Wendover, 1 ♀, 28.vi.1955. All *R. B. Benson.*

Small size and very short ovipositor are important features of this species.

## ***Microgaster canadensis*** Muesebeck

*Microgaster canadensis* Muesebeck, 1922 : 38.

♀. Anterior part of mesoscutum without punctation but markedly rugose at the origin of the notaulic courses. Preapical segment of the flagellum almost square in outline (♀ from Canada); flagellum not in the least bristly.

♂. Flagellum very long, heavy-looking; the basal segments decidedly flattened; the whole flagellum markedly pale beneath. Hind claw pectinate like that of female.

Material examined: CANADA (type locality). Ontario, 1 ♀, 1 ♂, ex *Compsolechia niveopulvella*; these two specimens in B.M. (N.H.) as well as female paratype.

Host: *Compsolechia niveopulvella* Chambers (Gelechiidae). No host known for the type series.

Rather close to *crassicornis* from which it differs in not having bristly antennae and differently armed claws.

## ***Microgaster reticulatus*** Shestakov

*Microgaster reticulatus* Shestakov, 1940 : 11.

I have seen a female of this species from the Riksmuseum, Stockholm, labelled " Microgaster reticulatus, sp. n., det Shestakov, Vladivostok, Suchan (*Malaise*) ".

♀. Flagellum very long, much tapered towards apex, bristly. Costad abscissa of the basalis short, only about one quarter as long as the mediad abscissa. Outer side of the hind tibia unusually densely beset with short, thick, fire-red spines. Propodeal rugosity coarser than in other species known to me; the propodeum itself, especially towards sides, is clothed with long, silvery white hairs.

Gaster somewhat short, tergite (2 + 3) being longer than following tergites together; the suture between tergites 2 and 3 is much deeper, broader and more distinctly costate than in any other species in this revision.

Length: ♀, 6 mm. without ovipositor.

E. SIBERIA: Vladivostok.

This is a most distinctive species, aberrant among those species with simple claws and probably representing a distinct species-group.

## ***Microgaster leechi*** Walley

*Microgaster leechi* Walley, 1935 : 57.

♀. This species is richly marked with yellow. Scape predominantly pale; flagellum pale almost throughout but the 2–3 basal segments darkened above. Hind coxa yellow throughout; hind femur reddish yellow; hind tibia almost dull reddish, with conspicuous apical infuscation; hind tarsus deeply infuscate throughout. The rather long maxillary palpi pale yellow.

Eyes, in a facial view, markedly convergent and the face with well marked keel on upper half; in one of the two specimens available (Ottawa), this keel is distinct as far as the clypeus. Flagellum somewhat thin, markedly bristly; penultimate segment one and a half times, and antipenultimate segment almost twice, as long as wide.

Costad abscissa of the basalis fully two fifths as long as the mediad abscissa. Claws simple (cf. *gelechiae*); outer side of hind tibia having a prickly appearance, its spines numerous and rather long.

Gaster beyond tergite 2 almost entirely reddish yellow (Clement) or with broad, medial, blackish band (Ottawa). Ovipositor sheath fully two thirds as long as the hind tibia; ovipositor evenly curved throughout.

♂. The flagellum is strikingly yellowish throughout, except that the two to three basal segments are darkened above; this contrast is more striking than in the female. Apex of hind femur faintly darkened above.

Material examined: CANADA: Quebec, Clement, 1 ♀, det. Mason. Ontario, Ottawa, 1 ♂, 1 ♀, vii and viii.1947 (*W. R. M. Mason*). U.S.A.: Maine, Dryden, 3 ♂, 26.vii.1959 (*G. H. Heinrich*); all in B.M. (N.H.).

## ***Microgaster gelechiae*** Riley

*Microgaster gelechiae* Riley, 1869 : 178.

Superficially very like *leechi* with which it may be compared as follows:

♀. Entire hind leg distal to the coxa reddish yellow, the hind tarsus being as brightly coloured as its tibia; the hind coxa becomes darkened on about basal half.

Face broader than in *leechi*, the eyes less convergent and the sculpture more evenly rugose, finer. Hairs of the eyes slightly shorter. Flagellum not in the least bristly; the two preapical segments about one and one third times longer than wide. Hind claw with three pale spines. Ovipositor sheath almost three quarters as long as the hind tibia. Mesosternum with fine, transverse striation.

♂. Flagellum blackish above, faintly paler beneath.

Material examined: U.S.A., Virginia, Great Falls, 1 ♀, 1 ♂, det. Gahan, ex *Gnorimoschema gallae-solidaginis*, in B.M. (N.H.).

Host: *Gnorimoschema gallae-solidaginis* Riley.

There is in the B.M. (N.H.) a single female from CANADA (Toronto, Ottawa, 22.v.1956, *R. B. Benson*) that I believe to be this species. The yellow markings of the dorsal surface of the gaster are reduced to a yellow spot at each lateral corner of tergite 3; these spots are united by the faintly yellow, apical margin of the tergite.

## ***Microgaster kuchingensis*** Wilkinson

*Microgaster kuchingensis* Wilkinson, 1927 : 176, 1929 : 120.

A species largely characterized by the heavily blackened hind tibia with its white basal ring.

♀. Front and middle tarsi whitish yellow.

Submedian cell of the hind wing without hairs. Hairy part of ovipositor sheath about half as long as the hind tibia; ovipositor thick, evenly downcurved. Hypopygiom short, evenly sclerotized and without lateral creases.

BORNEO: Kuching (type locality). PHILIPPINES: Mt. Macolod, 1 ♀, 24.x.1953 (*H. M. & D. Townes*); Mindanao, Surigao, 1 ♀ (*Baker*).

Type in the B.M. (N.H.).

I am puzzled by a single female from INDIA: United Provinces, Dehra Dun, ex *Pyrausta codesalis* Walker, defoliating bamboo, (Wilkinson, 1929 : 120). The darkened areas of the fore wing are less contrasted than in typical material, the hind tibia is not so deeply infuscated and the pale basal ring is less sharply discrete and covers almost basal quarter of tibia. The striate element in the striate-punctate sculpture of the basal tergites of the far eastern material is absent in this single specimen and most of the surface of tergites 1 and 2 is describable as predominantly punctate and shiny.

## ***Microgaster magnificus*** Wilkinson

(Text-fig. 15)

*Microgaster magnifica* Wilkinson, 1929 : 120.

♀. With its entirely fulvous red thorax, darkened gaster and dark, smoky yellow wings, this is a very striking species. The curiously prolonged apex of the hypopygium is distinctive and unique among the species dealt with in this paper.

Hind tibia deeply infuscate but paler at extreme base; hind coxa infuscate but with a yellowish streak above and below.

Costad abscissa of the basalis fully one third as long as the mediad abscissa. Outer side of the hind tibia very densely spinose (cf. *tjibodas*).

Tergite 2 almost as smooth and as shining as 3, but with some vague punctation along anterior margin. Hairy part of the ovipositor sheath about one third as long as the hind tibia; ovipositor thin, straight basally but sharply downcurved at apex (Text-fig. 15).

♂. There are two paratypes in the B.M. (N.H.). One has the gaster considerably reddened medially. Both have the antenna brown but considerably paler beneath.

AUSTRALIA: Queensland, 2 ♀, (type and paratype); 2 ♂, (paratypes).

Type in the B.M. (N.H.).

In general heaviness of build this species is closer to *kuchingensis* than to *tjibodas* but for all that the two species are widely different. Whereas *kuchingensis* is striking on colour only and structurally is close to the European species with rugose face and simple claws, *magnificus* is aberrant on the shape of the hypopygium. This, of course, may turn out to be only a species-group character.

### ***Microgaster tjibodas*** Wilkinson

*Microgaster tjibodas* Wilkinson, 1927 : 177.

♀. A brightly coloured species with the legs almost entirely yellow. The thin hind tibia is reddish yellow with faint apical darkening; the hind tarsus is weakly infuscated and is much the same colour as the darkened apex of the hind tibia.

Sculpture of the face very fine, feebly rugose and very shiny. Flagellum thin, bristly, with the preapical segment fully one and a half times longer than wide.

First abscissa of the discoideus a little shorter than the second; costad abscissa of the basalis slightly more than one quarter as long as the mediad abscissa. Spines of the outer side of the hind tibia very fine and very sparse.

Horizontal part of tergite 1 smooth-looking, very shiny and with scattered irregular pits and punctures. Tergite 2 almost smooth. Hairy part of the ovipositor sheath about three fifths as long as the hind tibia. Hypopygium thin, membranous and with several lateral creases.

JAVA: Tjibodas (type locality).

Type in the B.M. (N.H.).

I know this species only from the type.

### ***Microgaster russatus*** Haliday

*Microgaster russatus* Haliday, 1834 : 237.

♀. Flagellum pale at least beneath. Stigma usually markedly bicoloured but in one specimen in the B.M. (N.H.) entirely yellow. The hind tarsus varies from black to dull reddish with the apical segment the darkest.

Japanese specimens (♀) have the pale parts of the body and legs yellowish rather than red and the apical infuscation of the hind tibia more extensive.

EUROPE. JAPAN.

Host: *Orthotelia sparganella* Thunberg (Plutellidae) (in the literature). *Chilo suppressalis* Walker; *Chilo simplex* Butler. Both in Japan. Specimens in B.M. (N.H.) *Crambus paludellus* Hübnagel (Crambidae) (in England, bred by *R. L. E. Ford*).

I do not think there has ever been any confusion about the identity of this very distinctive species.

## ***Microgaster rugulosus*** Nees

(Text-fig. 31)

*Microgaster rugulosus* Nees, 1834 : 163.

This species departs from the typical *Microgaster* pattern in that the apical, polished band of the scutellum becomes very narrow at middle owing to the considerable amount of punctation at the apex of the scutellar triangle.

The general surface of the gaster is much duller and more sculptured than *russatus* and tergite (2 + 3) occupies a much larger area beyond the first tergite (Text-fig. 31).

Hind coxa densely punctate all over. Hind tibia without apical infuscation; its inner spur unusually short, not quite reaching the middle of the hind basitarsus.

EUROPE.

## ***Microgaster melligaster*** Provancher

*Microgaster melligaster* Provancher, 1886 : 143.
*Microgaster rubricoxus* Provancher, 1888 : 386.

This species is much more closely related to *russatus* than to *rugulosus* and in fact is very like the former species from which it differs as follows:

♀. Two basal segments of gaster entirely dark; remaining segments either entirely darkened (1 ♀, in B.M., Canada, Ontario) or reddened along sides (2 ♀, U.S.A., Maine).

Disc of scutellum more narrowed behind, even slightly constricted. Segments of the hind tarsus considerably shorter. Areolet in six out of seven specimens triangular; in *russatus*, it is distinctly four-sided.

Two basal segments of gaster less transverse; tergite 3 (i.e. tergite (2 + 3) beyond the suture) smooth, unsculptured; in *russatus*, this segment shows considerable coarse, rugose punctation.

U.S.A.: Maine, 2 ♀, 2 ♂. CANADA: Ontario, 2 ♂, 1 ♀. All in the B.M. (N.H.). Other characters for this species are given in the key.

## ***Microgaster nerione*** **sp. n.**

(Text-fig. 16)

♀. Middle femur infuscate throughout; front femur somewhat darkened. Fore wing hyaline proximal to the areolet and also within the radial cell; otherwise faintly darkened. Gaster blackish but becoming dark brown beneath.

Face strongly shining, its sculpture very weak, obsolescent. Ocelli in a low triangle, the posterior tangent to the anterior ocellus cutting the posterior pair. Flagellum long, rather thin, slightly bristly; antennal segment sixteen fully twice as long as wide (two apical segments missing).

Mesoscutum very smooth-looking, virtually without a trace of punctation in front and with only very weak rugosity at the origin of the notaulic courses. First abscissa of the discoideus distinctly shorter than the second; costad abscissa of the basalis hardly one third as long as the mediad abscissa so that the first discoidal cell is somewhat high. Inner spur of the hind tibia unusually short, only just reaching beyond middle of hind basitarsus; spines of the outer side of the hind tibia somewhat sparse; those along upper edge golden; those below, whitish; hind claw with three, close, blackish spines. Anterior part of the mesopleurum strongly shining, virtually impunctate.

Tergite 1 rather strongly narrowed basally and hence markedly triangular. Tergite 2 about three times as wide as long, showing the usual type of rugosity but this tending to fade out medially; tergite 3 as long as 2. Ovipositor thick, strongly curved. Posterior edge of hypopygium markedly sinuate (Text-fig. 16).

Length: 4·3 mm., without ovipositor.

Type ♀. MEXICO: Guerrero, Omilteme, 8,000 ft., viii (*H. H. Smith*), B.M. (N.H.).

A rather slender species, distinguished from all others with toothed claws by the evenly sclerotized hypopygium. This feature, however, does not relate the species, in my opinion, to the European *grandis*-group.

### SPECIES INQUIRENDAE

1. *Microgaster campestris* Tobias, 1964 : 210.
   KASAKHSTAN. Tobias states that this species is close to *curvicrus* Thomson.
2. *Microgaster claritibia* Papp, 1959 : 405.
   HUNGARY. Almost certainly a species of *Protomicroplitis*.
3. *Microgaster fusca* Papp, 1959 : 407.
   HUNGARY. Papp states that this species is related to *Microgaster postica* Nees. Probably a species of *Protomicroplitis*.
4. *Microgaster procris* Fischer, 1964 : 42.
   AUSTRIA. Bred from *Procris notata* Zeller (Zygaenidae). Probably a species of *Protomicroplitis*.
5. *Microgaster rugosicoxa* Papp, 1959 : 408.
   HUNGARY. Papp states that this species is related to *Microgaster scotica* Marshall (now *Protomicroplitis scotica* (Marshall) Nixon, 1965 : 252. Evidently a species of *Protomicroplitis*.
6. *Microgaster tegularius* Papp, 1959 : 407.
   HUNGARY. Papp says this species comes close to *Microgaster circumvectus* Lyle (now *Protomicroplitis circumvectus* (Lyle) Nixon, 1965 : 256). Evidently a species of *Protomicroplitis*.
7. *Microgaster dudichi* Papp, 1961 : 154.
   GERMANY. This species certainly belongs to *Microgaster* s. str. Papp places it near *tibialis* Nees but this does not necessarily relate it to the species for which I use the name " *tibialis* " in this paper.
8. *Protomicroplitis kasachstanica* (Tobias) **comb. n.**
   *Hygroplitis kasachstanica* Tobias, 1964 : 208. KASAKHSTAN. One female paratype in the B.M. (N.H.), presented by Dr. Tobias. Tobias states that this species is related to *Hygroplitis abdominalis* Nees (now *Protomicroplitis abdominalis* (Nees) Nixon, 1965 : 254); it is certainly closely related to this species and may not really be distinct from it. Nevertheless, without examining further specimens I hesitate to sink Tobias' species.
9. *Protomicroplitis stepposa* (Tobias) **comb. n.**
   *Hygroplitis stepposa* Tobias, 1964 : 209.
   This species seems to be closely related to *Protomicroplitis meges* Nixon, 1965 : 251, a species transitional between the *abdominalis*- and *scotica*-groups

of *Protomicroplitis* (Nixon, 1965); *stepposa* is a much more brightly coloured species than *meges*, with the hind tibia entirely reddish yellow and the mesoscutum with larger punctures and their interspaces much more polished.

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# AN INDEX-CATALOGUE OF AFRICAN PHANEROPTERINAE (ORTHOPTERA: TETTIGONIIDAE)

D. R. RAGGE

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# AN INDEX-CATALOGUE OF AFRICAN PHANEROPTERINAE (ORTHOPTERA : TETTIGONIIDAE)

*By* D. R. RAGGE

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## SYNOPSIS

A catalogue is given of all the genera and species of Phaneropterinae known at present to occur in Africa and its off-shore islands (but not those of the Mediterranean Sea or the Malagasy Sub-region), and in the Arabian peninsula. The species are arranged alphabetically under the genera to which they have been assigned in the most recent literature, and the arrangement of the genera is also alphabetical. Generic and specific synonyms, junior homonyms and deliberate variations in spelling are listed chronologically under the valid name. The type-species is cited for all generic names, and full information on the type-material is given for all specific names. The catalogue includes 115 genus-group and 358 species-group names; of these, eighty-three generic, 295 specific and seven subspecific names are currently regarded as valid. The status of the Phaneropterinae is discussed.

## INTRODUCTION

THIS catalogue has been compiled as the first stage of a comprehensive revision of the African Phaneropterinae. It includes all the species of Phaneropterinae known at present to occur in Africa, listed alphabetically under the genera to which they have been assigned in the most recent literature. As a deliberate policy, no new combinations (with the exception of an unavoidable one mentioned below) or synonyms are established in this paper; any necessary nomenclatorial changes will appear in the systematic revision to be published later. With the exception of groups covered by recent revisions (Ragge, 1955, 1956*a*, 1956*b*, 1957, 1960*a*, 1960*b*, 1961*a*, 1961*b*, 1962*a*, 1962*b*, 1964) the nomenclature will thus be subject to some alteration during the next few years. However, the standard of taxonomic work on the Tettigoniidae during most of the past century has been remarkably high and there are very few nomenclatorial problems.

The geographical region covered by this catalogue includes the whole of the African mainland and off-shore islands (e.g. Socotra, Zanzibar and the islands of the Gulf of Guinea) and the Arabian peninsula, but excludes the Malagasy Sub-region; there is such a high degree of endemism in the Phaneropterinae of this sub-region that it is more appropriate to treat them separately. The Mediterranean islands are not included, and the inclusion of North Africa adds only thirteen species, all belonging to the genus *Odontura* Rambur.

## TREATMENT

The eventual systematic arrangement of the African genera of Phaneropterinae will naturally depend on the comprehensive revision to be undertaken during the next few years, and it has therefore been thought better at this stage to list the genera alphabetically. Generic synonyms, junior homonyms and deliberate variations in spelling are listed chronologically under the valid generic name. The entries for each genus and generic synonym include a reference to the original description and the citation of the type-species and its mode of fixation; where the type-species was fixed by subsequent designation, a bibliographical reference is given to the fixation. The type-species is cited in its original combination; where it is now a junior synonym the present valid name is given in brackets. Where a type-species does not occur in Africa, the country of the type-locality is given in brackets. All generic synonyms are cited, including those based on non-African type-species; the type-species are cited in the same way as those of valid generic names.

The African species of each genus are listed alphabetically, together with references to their original descriptions and a statement of the nature and data of the type-material and the institution in which the type-material is housed. The absence of any information on the number and sex of the specimens in the type-series indicates that this information was not given with the original description and has not been determined subsequently. Where a species is based on a type-series from more than one locality, the citation of one depository after the last locality indicates that all the type-material is believed to be in that depository. It should be noted that the stated numbers of syntypes are not always known for certain, but always with at least a high degree of probability. A number of species described by Sjöstedt (1909) from Kilimanjaro and Meru were based on long series of syntypes, a proportion of which were sent out from Stockholm, where Sjöstedt worked, to other museums; as the exact extent of this distribution of syntypes is unknown, the only depository cited in these cases is the Naturhistoriska Riksmuseum, Stockholm.

Where a species has been transferred from its original genus, the name of the latter is given in brackets after the reference to the original description; a change in status is noted in a similar way. A question-mark before the original genus indicates that the original generic assignment was doubtful; one before the specific name itself indicates that the present generic assignment is doubtful. Where a species is currently regarded as polytypic, an entry is given for each subspecies and there is no separate entry for the species as a whole.

Specific synonyms (including those based on non-African type-specimens) and deliberate variations in spelling are indented and listed chronologically under each species or subspecies; they are otherwise given the same treatment as valid specific names. A question-mark before a specific synonym indicates that the synonymy is doubtful.

Territories in which type-localities are situated are given their current political names. Where the country is unknown the locality data originally published is quoted between inverted commas. Provinces are not cited unless given with the published locality data except in the case of South African specimens, for which the provinces (if known) are always cited.

Where a lectotype has been designated a bibliographical reference is given to the designation. No lectotypes are designated in this catalogue.

The museums and other institutions in which the type-material is housed are abbreviated in this catalogue as follows.

| | |
|---|---|
| ANS | Academy of Natural Sciencies of Philadelphia. |
| BMNH | British Museum (Natural History). |
| DEI | Deutsches Entomologisches Institut, Eberswalde (East Germany). |
| EIETH | Entomologisches Institut of the Eidgenössische Technische Hochschule, Zürich. |
| IEE | Instituto Español de Entomología, Madrid. |
| ILEA | Instituto e Laboratorio di Entomologia Agraria, Portici. |
| IMZU | Istituto e Museo di Zoologia of the Università di Torino, Turin. |
| IRSNB | Institut Royal des Sciences Naturelles de Belgique, Brussels. |
| IZPAN | Instytut Zoologiczny of the Polska Akademia Nauk, Warsaw. |
| IZU | Istituto di Zoologia of the Università di Pavia. |
| MCSN | Museo Civico di Storia Naturale, Genoa. |
| MHN | Muséum d'Histoire Naturelle, Geneva. |
| MLZA | Museu e Laboratório Zoológico e Antropológico, Lisbon. |
| MNHN | Muséum National d'Histoire Naturelle, Paris. |
| MRAC | Musée Royal de l'Afrique Centrale, Tervuren. |
| NM | Naturhistorisches Museum, Vienna. |
| NR | Naturhistoriska Riksmuseum, Stockholm. |
| SAM | South African Museum, Cape Town. |
| SMN | Staatliches Museum für Naturkunde, Stuttgart. |
| TM | Természettudományi Múzeum, Budapest. |
| UM | University Museum, Oxford. |
| UZI | Universitetets Zoologiska Institution, Lund. |
| ZM | Zoologisches Museum, Hamburg. |
| ZMHU | Zoologisches Museum of the Humboldt-Universität, Berlin. |

In the course of compiling this catalogue I have come across one generic and two specific names published before Kirby's catalogue of 1906, but not included in it. The generic name is *Cameronia*, which first appeared in the combination *Symmetropleura* (*Cameronia*) *africana* Brunner in a paper by Karsch (1889 : 450). The name was ignored by Brunner (1891) in the supplement to his earlier monograph (Brunner, 1878) but was quoted, in the same combination, by Bolívar (1906 : 349). As far as I know these are the only two occasions on which this name has appeared in print. *Cameronia* is clearly a genus-group name and is available under Article 16 (a) (v) of the *International Code of Zoological Nomenclature*, with *Symmetropleura africana* Brunner as its type-species, by monotypy. It seems highly improbable that Karsch intended the name to be regarded as a subgenus of *Symmetropleura* Brunner; there is no other instance of either him or his contemporary Brunner using a subgeneric name, and on the following page of his 1889 paper (*op. cit.*, p. 451) he describes another species of *Symmetropleura* without giving it a subgeneric assignment. It seems more likely that Karsch was considering *Cameronia* as an alternative generic name for *Symmetropleura africana* Brunner, and so cited it in brackets. No subgenera are recognized in this catalogue and I have merely listed *Cameronia* in the synonymy of *Symmetropleura*. If, as seems probable, revisionary work shows that the African species at present assigned to the otherwise New World genus *Symmetropleura* should be separated at the generic level, the name *Cameronia* is available for any resulting genus that contains *Symmetropleura africana* Brunner.

The two specific names missed by Kirby (1906) are *Cestromoecha crassipes* Karsch (described in a footnote—Karsch, 1890 : 364) and *Rhegmatopoda brunneri* Kirby. The latter name, proposed as a nomen novum (Kirby, 1900 : 215), was based on Brunner's (1878 : 89) description of a male specimen from Grahamstown in the Naturhistorisches Museum, Vienna, then regarded by Brunner as *Horatosphaga leptocerca* Stål, and Kirby's examination of a male specimen from Barberton in the British Museum (Natural History). Although these specimens were not described by Kirby, the name *R. brunneri* is available under Article 16 (a) (i) of the *International Code of Zoological Nomenclature.* The name *Rhegmatopoda* Brunner has since become a junior synonym of *Conchotopoda* Karsch (Ragge, 1960*a* : 325) and *brunneri* is thus listed in this catalogue under *Conchotopoda* Karsch, forming the new combination *Conchotopoda brunneri* (Kirby) **comb. n.**

## THE STATUS OF THE PHANEROPTERINAE

The inter-relationships and systematic arrangement of the African genera of Phaneropterinae will be considered in the course of forthcoming revisionary work, but it is appropriate at this stage to consider briefly the status of the group as a whole.

The Phaneropterinae have been regarded as a subfamily of Tettigoniidae (also called at various times, and often in a broader sense, Locustariae, Locustina, Locustidae, Locustodea and Phasgonuridae) for well over a century: they were given this status, together with *Mecopoda* and *Phyllophora* (now the type-genera of two other subfamilies), by Burmeister (1838 : 684). In 1878 Brunner, in his classic *Monographie der Phaneropteriden,* established the group in its present sense and laid the foundation for all subsequent systematic work on the Phaneropterinae. The subfamily suffix *-inae* was not in use at this time, but Brunner referred to the group as a " Subfamilie " and used for it the Latin category " tribus ". Brunner reaffirmed his classification in his works of 1891 and 1893. The group-name appeared with the currently used subfamily suffix in Saussure & Pictet's work of 1897, and was again used in this form by Kirby (1906). This usage was adopted almost universally and still prevails today (Bei-Bienko, 1954, 1964; Blatchley, 1920; Brues, Melander & Carpenter, 1954; Chopard, 1922, 1943, 1947; Essig, 1947; Grant, 1964; Imms, 1957; Zeuner, 1936*a*).

During this period the general classification of the Ensifera came under the strong stabilizing influence of two major works on their morphology and phylogeny, one by Ander and the other by Zeuner, published almost simultaneously in 1939. The thoroughness and comprehensiveness of these studies clearly makes them the best available basis for considering the inter-relationships of the sub-groups of Ensifera, and it is significant that the classifications adopted in the two works are almost identical. The Phaneropterinae were again regarded as a subfamily of the Tettigoniidae.

This long period of stability in the status of the Phaneropterinae has been affected during the past twenty years by a movement among European orthopterists to raise the status of nearly all the groups of Saltatoria, i.e. to elevate most of the families to superfamilies or even suborders, and most of the subfamilies to families. This movement does not stem from new morphological or phylogenetic discoveries but simply from the view that these groups are at present ranked at too low a level, or, in one case (Dirsh, 1961 : 358), from the belief that family and subfamily rank can be objectively defined. The effect of this action on the Phaneropterinae is to raise them to family rank, the Tettigoniidae becoming a superfamily more restricted in scope than the Tettigonioidea of Ander (*op. cit.*), which is left without a name.

Although there are a few earlier instances of the Phaneropterinae being accorded family status (e.g. Burr, 1910; Zacher, 1917), the first major recent work in which this was done was that of Chopard (1949), and the practice has since been adopted by Beier (1955) and in the faunal works of Harz (1957, 1960). Although it seems likely that some other modern orthopterists whose specialities lie outside the Ensifera would favour family status for the Phaneropterinae, the group is still regarded as a subfamily in most recent taxonomic publications in both Europe and America (e.g. Bei-Bienko, 1964; Grant, 1964; Karabag, 1964; Ragge, 1964); indeed, some orthopterists (e.g. Uvarov, 1924 : 492–493; Zeuner, 1936*a* : 107, 1936*b* : 300–301, 1939 : 115) have suggested that a number of the other subfamilies of Tettigoniidae would be better regarded as tribes.

There is of course a trend during the earlier stages of the taxonomic study of all groups towards the raising in rank of each level of the hierarchy, and it may seem at first sight that there is still a need for such a trend in the classification of the Ensifera. However, in my view the classification firmly established by Ander (*op. cit.*) and since widely adopted by orthopterists offers an acceptable compromise in the rank accorded to each group, and there is no reason why it should not be used, with minor modifications, as a framework for taxonomic work on this suborder for many years to come. In the case of the Phaneropterinae there is room for only one category between the group as a whole and its genera, one that is well provided for by tribes; if the group is regarded as a family, either the subfamily or tribe category will be left unemployed. This is not the place for further discussion of the problems of the classification of the Ensifera; it suffices for me to lend my support to the view still expressed by the majority of orthopterists—that the Phaneropterinae are best regarded as a subfamily.

## CATALOGUE OF AFRICAN PHANEROPTERINAE

### ***PHANEROPTERINAE*** Burmeister

Phaneropteridae Burmeister, 1838 : 684.

Camptoxiphae Serville, [1838] : 399. (Not based on the name of a contained genus and therefore unavailable under Article 11 (e) of the *International Code of Zoological Nomenclature.*)

Phaneropterinae; Saussure & Pictet, 1897 : 310.

## *ANISOTOCHRA* Karsch

*Anisotochra* Karsch, 1889 : 430. Type-species: *Anisotochra gracilipes* Karsch, by monotypy.

**gracilipes** Karsch, 1889 : 431. Holotype ♀, CONGO (KINSHASA): Kuako to Kimpoko (ZMHU, Berlin).

## *ARANTIA* Stål

*Arantia* Stål, 1874 : 25. Type-species: *Holochlora fatidica* Stål, by monotypy.

**accrana** Karsch, 1889 : 436. Holotype ♀, GHANA: Accra (ZMHU, Berlin).
**angustipennis** Chopard, 1954 : 36. Holotype ♂, GUINEA: Nimba (MNHN, Paris).
**brevipes** Chopard, 1954 : 37. 1 ♂, 1 ♀ syntypes, GUINEA: Nimba (MNHN, Paris).
**excelsior** Karsch, 1889 : 435. Holotype ♂, SIERRA LEONE (IZPAN, Warsaw).
**fasciata** Walker, 1869 : 378 (*Phylloptera*). Holotype ♀, GAMBIA (BMNH, London).
*atrolineata* Brunner, 1891 : 69. Holotype ♀, "SLAVE COAST" (EIETH, Zürich).
**fatidica** Stål, 1873 : 43 (*Holochlora*). Holotype ♂, SIERRA LEONE (NR, Stockholm).
**gabunensis** Brunner, 1891 : 64. Holotype ♀, GABON (NM, Vienna).
**gestri** Griffini, 1906 : 384. Holotype ♂, CONGO (BRAZZAVILLE): N'jole (MCSN, Genoa).
**hydatinoptera** Karsch, 1889 : 436. 1 ♂, 1 ♀ syntypes, NIGERIA (IZPAN, Warsaw).
**latifolia** Karsch, 1890*c* : 356. 1 ♂, 1 ♀ syntypes, CAMEROUN : Barombi (ZMHU, Berlin).
**leptocnemis** Karsch, 1890*c* : 358. Holotype ♀, CAMEROUN : Barombi (ZMHU, Berlin).
**mammisignum** Karsch, 1896 : 332. Holotype ♀, CAMEROUN: Lolodorf (ZMHU, Berlin).
**manca** Bolívar, 1906 : 332. Holotype ♂, CAMEROUN (IEE, Madrid).
**marmorata** Karsch, 1889 : 435. Holotype ♀, "CONGO" (IZPAN, Warsaw).
**melanotus** Sjöstedt, 1901 : 6. Holotype ♂, CAMEROUN: Bonge (NR, Stockholm).
**orthocnemis** Karsch, 1890*c* : 357. 1 ♂ syntype, CAMEROUN; 1 ♀ syntype, CAMEROUN: Barombi (ZMHU, Berlin).
**ovalipennis** Chopard, 1954 : 38. Holotype ♀, GUINEA: Nimba, N'Zo (MNHN, Paris).
**rectifolia** Brunner, 1878 : 137. Holotype ♂, FERNANDO POO (NM, Vienna).
**regina** Karsch, 1888 : 434. Holotype ♀, GABON (ZMHU, Berlin).
**retinervis** Karsch, 1888 : 437. 2 ♂ syntypes, CAMEROUN: Barombi (ZMHU, Berlin); 1 ♂ syntype, "Chinchoxo" (ZMHU, Berlin); 1 ♂ syntype, SIERRA LEONE (IZPAN, Warsaw).
**scurra** Karsch, 1896 : 331. Holotype ♂, CAMEROUN: Lolodorf (ZMHU, Berlin).
**simplicinervis** Karsch, 1889 : 438. 1 ♂ syntype, "Chinchoxo"; 1 ♀ syntype, CONGO (KINSHASA): Kuako to Kimpoko (ZMHU, Berlin).
**spinulosa** Brunner, 1878 : 137. 1 ♂, 2 ♀ syntypes, SOUTH AFRICA: Natal, Durban (NM, Vienna).
**tigrina** Bolívar, 1906 : 330. Holotype ♂, FERNANDO POO (IEE, Madrid).
**ugandana** Rehn, 1914 : 176. Holotype ♀, UGANDA (DEI, Eberswalde).

## *ATLASACRIS* Rehn

*Atlasacris* Rehn, 1914 : 153. Type-species: *Atlasacris peculiaris* Rehn, by original designation.

**peculiaris** Rehn, 1914 : 154. Holotype ♂, "OST-AFRIKA" (ZMHU, Berlin).

## *AZAMIA* Bolívar

*Azamia* Bolívar, 1906 : 339. Type-species: *Azamia biplagiata* Bolívar, by monotypy.

**biplagiata** Bolívar, 1906 : 341. Holotype ♂, CAMEROUN (IEE, Madrid).
**doriae** Griffini, 1906 : 395 (*Vossia*). Holotype ♂, FERNANDO POO: Musola (MCSN, Genoa).

## *BONGEIA* Sjöstedt

*Bongeia* Sjöstedt, 1901 : 9. Type-species: *Bongeia puncticollis* Sjöstedt, by monotypy.

**brevicauda** Ebner, 1943 : 265. Holotype ♀, FERNANDO POO (DEI, Eberswalde).
**puncticollis** Sjöstedt, 1901 : 9. Holotype ♀, CAMEROUN (NR, Stockholm).

## *BUEACOLA* Sjöstedt

*Bueacola* Sjöstedt, 1912 : 7. Type-species: *Bueacola cornigera* Sjöstedt, by monotypy.

**cornigera** Sjöstedt, 1912 : 8. Holotype ♂, CAMEROUN: Buea (NR, Stockholm).

## *BUETTNERIA* Karsch

*Büttneria* Karsch, 1889 : 444. Type-species: *Buettneria maculiceps* Karsch, by monotypy.
*Buettneria* Karsch, Brunner, 1891 : 105.
*Stenacropteryx* Karsch, 1896 : 339. Type-species: *Stenacropteryx eburneiguttata* Karsch (= *Buettneria maculiceps* Karsch), by monotypy.

**maculiceps** Karsch, 1889 : 445. Holotype ♀, CONGO (KINSHASA): Kuako to Kimpoko (ZMHU, Berlin).
*eburneiguttata* Karsch, 1896 : 339 (*Stenacropteryx*). Holotype ♂, CAMEROUN: Lolodorf (ZMHU, Berlin).

## *CATOPTROPTERYX* Karsch

*Catoptropteryx* Karsch, 1890*c* : 361. Type-species: *Catoptropteryx guttatipes* Karsch, by monotypy (two other species doubtfully included).

**afra** Karsch, 1889 : 446 (*Caedicia*). Holotype ♀, NIGERIA: Benue (IZPAN, Warsaw).
**apicalis** Bolívar, 1893 : 177 (*Caedicia*). Holotype ♀, IVORY COAST: Assinie (IEE, Madrid).
**capreola** Karsch, 1896 : 332. Holotype ♂, CAMEROUN: Lolodorf (ZMHU, Berlin).
**extensipes** Karsch, 1896 : 336. Holotype ♂, CAMEROUN: Lolodorf (ZMHU, Berlin).
**guttatipes** Karsch, 1890*c* : 362. Holotype ♂, CAMEROUN: Barombi (ZMHU, Berlin).
**immaculipennis** Karsch, 1896 : 333. Holotype ♂, CAMEROUN: Lolodorf (ZMHU, Berlin).
**latipennis** Chopard, 1955 : 267. Holotype ♂, SOUTH AFRICA: Cape Province, Tzitzikama Forest, Stormsrivierpiek (UZI, Lund).
**maculipennis** Karsch, 1896 : 333. Holotype ♀, CAMEROUN: Lolodorf (ZMHU, Berlin).
**neutralipennis** Karsch, 1896 : 334. 1 ♂ syntype, TOGO: Misahöhe; 1 ♀ syntype, TOGO: Bismarckburg (ZMHU, Berlin).
**nigrospinosa** Brunner, 1891 : 97 (*Caedicia*). Holotype ♀, CAMEROUN (IZPAN, Warsaw).
**punctulata** Karsch, 1890*b* : 260 (*Caedicia*). Holotype ♀, CAMEROUN: Kribi (ZMHU, Berlin).
**signatipennis** Karsch, 1896 : 334. 1 ♂ syntype, CAMEROUN: Victoria; 1 ♀ syntype, CAMEROUN: Lolodorf (ZMHU, Berlin).

## *CESTROMOECHA* Karsch

*Cestromoecha* Karsch, 1893 : 128. Type-species: *Poreuomena tenuipes* Karsch, by original designation.

**crassipes** Karsch, 1890*c* : 364 (*Poreuomena*). Holotype ♀, CAMEROUN (ZMHU, Berlin).
**mundamensis** Karsch, 1896 : 338. 1 ♂, 1 ♀ syntypes, CAMEROUN: Mundame (ZMHU, Berlin).
**tenuipes** Karsch, 1890*c* : 363 (*Poreuomena*). 3 ♀ syntypes, CAMEROUN: Barombi (ZMHU, Berlin).

## *CONCHOTOPODA* Karsch

*Conchotopoda* Karsch, 1887*a* : 44. Type-species: *Conchotopoda belcki* Karsch, by monotypy.
*Rhegmatopoda* Brunner, 1891 : 44. Type-species: *Horatosphaga leptocerca* Stål, by monotypy.

***belcki*** Karsch, 1887*a* : 45. Holotype ♂, SOUTH WEST AFRICA: Damaraland (ZMHU, Berlin).
***brunneri*** Kirby, 1900 : 215 (*Rhegmatopoda*) (see p. 78). 1 ♂ syntype, SOUTH AFRICA: Transvaal, Barberton (BMNH, London); 1 ♂ syntype, SOUTH AFRICA: Cape Province, Grahamstown (NM, Vienna).
***crassicauda*** Ragge, 1960*a* : 328. Holotype ♂, SOUTH AFRICA: Transvaal, Pietersburg (SAM, Cape Town).
***grallatoria*** Stål, 1856 : 170 (?*Phaneroptera*). Holotype ♂, SOUTH AFRICA: "Caffraria" (NR, Stockholm).
***leptocerca*** Stål, 1876 : 59 (*Horatosphaga*). Holotype ♂, SOUTH WEST AFRICA: Damara (NR, Stockholm).
***parva*** Ragge, 1960*a* : 330. Holotype ♂, SOUTH AFRICA: Orange Free State, Witzieshoek (BMNH, London).

## *CORYCOMIMA* Karsch

*Corycomima* Karsch, 1889 : 457 (proposed conditionally, but available from this date under Article 17 (8) of the *International Code of Zoological Nomenclature*). Type-species: *Plangia camerata* Karsch (= *Corycomima flavescens* (Walker)), by monotypy.
*Corycomima* Karsch, Karsch, 1896 : 343 (proposed unconditionally).

***flavescens*** Walker, 1869 : 386 (*Orophus*). Holotype ♀, GAMBIA (BMNH, London).
*camerata* Karsch, 1889 : 457 (*Plangia*). Holotype ♀, CAMEROUN: Barombi (ZMHU, Berlin).

## *CORYMETA* Brunner

*Corymeta* Brunner, 1878 : 126. Type-species: *Phaneroptera amplectens* Schaum, by monotypy.

***amplectens*** Schaum, 1853 : 777 (*Phaneroptera*). Holotype ♂, MOZAMBIQUE (ZMHU, Berlin).

## *DANNFELTIA* Sjöstedt

*Dannfeltia* Sjöstedt, 1901 : 19. Type-species: *Dannfeltia nana* Sjöstedt, by monotypy.

***nana*** Sjöstedt, 1901 : 19. Holotype ♂, "KONGO" (NR, Stockholm).

## *DAPANERA* Karsch

*Dapanera* Karsch, 1889 : 441. Type-species: *Dapanera genuteres* Karsch, by monotypy.

***eidmanni*** Ebner, 1943 : 263. Holotype ♂, FERNANDO POO (DEI, Eberswalde).
***genuteres*** Karsch, 1889 : 441. 2 ♂ syntypes, GHANA: Accra (ZMHU, Berlin).
***irregularis*** Karsch, 1890*b* : 258. 1 ♂, 1 ♀ syntypes, CAMEROUN: Kribi (ZMHU, Berlin).

## *DEBRONA* Walker

*Debrona* Walker, 1870 : 480. Type-species: *Debrona cervina* Walker, by monotypy.
*Otiaphysa* Karsch, 1889 : 453. Type-species: *Otiaphysa habetata* Karsch (= *Debrona cervina* Walker), by monotypy.

***angustipennis*** Burr, 1900 : 43 (*Otiaphysa*). Holotype ♀, SOMALI REPUBLIC: Whardi Datal (UM, Oxford).
***cervina*** Walker, 1870 : 481. Holotype ♀, SOUTH AFRICA (BMNH, London).
*habetata* Karsch, 1889 : 454 (*Otiaphysa*). Holotype ♀, TANZANIA: Usambara (ZMHU, Berlin).

## *DIOGENA* Brunner

*Diogena* Brunner, 1878 : 224. Type-species: *Phaneroptera fausta* Burmeister, by monotypy.

***denticulata*** Chopard, in Chopard & Kevan, 1954 : 328. Holotype ♀, KENYA: Northern Frontier Distr., El Wak (BMNH, London).

***fausta*** Burmeister, 1838 : 689 (*Phaneroptera*). Holotype ♂, SUDAN: Nubia (ZMHU, Berlin).

## *DIONCOMENA* Brunner

*Dioncomena* Brunner, 1878 : 208. Type-species: *Dioncomena ornata* Brunner, by monotypy.

***ornata*** Brunner, 1878 : 208. 2 ♂, 1 ♀ syntypes, "ZANZIBAR" (NM, Vienna); 1 ♂ syntype, "ZANZIBAR" (IEE, Madrid).

***superba*** Karsch, 1889 : 449. Unknown number of syntypes of both sexes, TANZANIA: Bondei and Usambara (ZMHU, Berlin).

## *DITHELA* Karsch

*Dithela* Karsch, 1890*c* : 354. Type-species: *Dithela rectiloba* Karsch, by monotypy.

***acuticercus*** Sjöstedt, 1912 : 5. 2 ♂, 1 ♀ syntypes, CAMEROUN: Buea (NM, Stockholm).

***rectiloba*** Karsch, 1890*c* : 355. 1 ♂, 2 ♀ syntypes, CAMEROUN : Barombi (ZMHU, Berlin).

## *DREPANOPHYLLUM* Karsch

*Drepanophyllum* Karsch, 1890*c* : 358. Type-species: *Drepanophyllum marmoratum* Karsch, by monotypy.

*Karschia* Brunner, 1891 : 41. Type-species: *Karschia corrosa* Brunner (= *Drepanophyllum marmoratum* Karsch), by monotypy.

***corrosifolium*** Karsch, 1896 : 326. Unknown number of syntypes of both sexes, CAMEROUN: Yaunde and Lolodorf (ZMHU, Berlin).

***furcatum*** Ragge, 1962*a* : 307. Holotype ♂, UGANDA : Entebbe (BMNH, London).

***marmoratum*** Karsch, 1890*c* : 360. Holotype ♀, CAMEROUN: Barombi (ZMHU, Berlin).

*corrosa* Brunner, 1891 : 41 (*Karschia*). Holotype ♀, CAMEROUN (IZPAN, Warsaw).

## *DUCETIA* Stål

*Ducetia* Stål, 1874 : 11. Type-species: *Locusta japonica* Thunberg, by monotypy (type-locality: Japan).

*Paura* Karsch, 1889 : 439. Type-species: *Paura biramosa* Karsch, by subsequent designation (Kirby, 1906 : 407).

*Pseudisotima* Schulthess, 1898 : 199. Type-species: *Pseudisotima punctata* Schulthess, by monotypy.

*Kuwayamaea* Matsumura & Shiraki, 1908 : 7. Type-species: *Kuwayamaea sapporensis* Matsumura & Shiraki (= *Ducetia chinensis* (Brunner)), by original designation (type-locality: Japan).

*Telaea* Bolívar, 1922 : 201. Type-species: *Telaea quadripunctata* Bolívar (= *Ducetia punctipennis* (Gerstaecker)), by monotypy.

***biramosa*** Karsch, 1889 : 439 (*Paura*). Holotype ♀, TANZANIA: Usambara (ZMHU, Berlin).

***chelocerca*** Ragge, 1961*a* : 197. Holotype ♂, SOUTH AFRICA: Transvaal, junction of Crocodile and Marico Rivers (SAM, Cape Town).

**costata** Ragge, 1961*a* : 196. Holotype ♂, Congo (Kinshasa): Nyangwe (MRAC, Tervuren).
**crosskeyi** Ragge, 1961*a* : 192. Holotype ♂, Nigeria: Niger Province, Diko (BMNH, London).
**fuscopunctata** Chopard, 1954 : 35. Holotype ♂, Guinea: Nimba, Yalanzou (MNHN, Paris).
**loosi** Griffini, 1908*b* : 204. Holotype ♀, Congo (Kinshasa): Popocabacca (IRSNB, Brussels).
**macrocerca** Ragge, 1961*a* : 195. Holotype ♂, Congo (Kinshasa): Katanga, Kiambi (MRAC, Tervuren).
**parva** Ragge, 1961*a* : 205. Holotype ♂, Somali Republic: Haud (BMNH, London).
**punctata** Schulthess, 1898 : 199 (*Pseudisotima*). Holotype ♀, Ethiopia: Girma (MCSN, Genoa).
**punctipennis** Gerstaecker, 1869 : 215 (*Phaneroptera*). Holotype ♂, Kenya: Mt. Ndara (ZMHU, Berlin).
  *reticulosa* Karsch, 1889 : 440 (*Paura*). Holotype ♀, Kenya: Mombasa (ZMHU, Berlin).
  *quadripunctata* Bolívar, 1922 : 201 (*Telaea*). Holotype ♂, Kenya: Simba (lost).
**ramulosa** Ragge, 1961*a*: 198. Holotype ♂, Zambia: Luano Valley, R. Mulungushi (BMNH, London).
**sagitta** Ragge, 1961*a* : 199. Holotype ♂, Angola: Lepi (BMNH, London).
**vitriala** Ragge, 1961*a* : 204. Holotype ♂, Somali Republic: Haud (BMNH, London).

## *ENOCHLETICA* Karsch

*Enochletica* Karsch, 1896 : 336. Type-species: *Enochletica ostentatrix* Karsch, by monotypy.

**ostentatrix** Karsch, 1896 : 337. Unknown number of syntypes of both sexes, Cameroun: Lolodorf (ZMHU, Berlin).

## *EPIPHLEBUS* Karsch

*Epiphlebus* Karsch, 1896 : 325. Type-species: *Epiphlebus crypterius* Karsch, by monotypy.

**crypterius** Karsch, 1896 : 325. Holotype ♀, Somali Republic (type-depository unknown).
**ruspolii** Schulthess, 1898 : 197. Holotype ♀, Somali Republic: Ganana (MCSN, Genoa).

## *EULIOPTERA* Ragge

*Eulioptera* Ragge, 1956*a* : 266. Type-species: *Phaneroptera reticulata* Brunner, by original designation.

**breviala** Ragge, 1956*a* : 277. Holotype ♂, Congo (Kinshasa): Kivu, Kibumba (MRAC, Tervuren).
**longicerca** Ragge, 1956*a* : 273. Holotype ♂, Congo (Kinshasa): Kinshasa (MRAC, Tervuren).
**reticulata leptomorpha** Ragge, 1956*a* : 271. Holotype ♂, Zambia: Mporokoso distr., Mweru Wa Ntipa (BMNH, London).
**reticulata reticulata** Brunner, 1878 : 213 (*Phaneroptera reticulata*). Holotype ♀, South Africa: Cape Province, Grahamstown (NM, Vienna).
**spinulosa** Ragge, 1956*a* : 274. Holotype ♂, Congo (Kinshasa): Kasenyi (BMNH, London).

## *EURYCORYPHA* Stål

*Eurycorypha* Stål, 1873 : 40. Type-species: *Phylloptera cereris* Stål, by original designation.
*Myrmecophana* Brunner, 1883 : 248. Type-species: *Myrmecophana fallax* Brunner, by monotypy.

**adicra** Karsch, 1892*b* : 75. Holotype ♀, Cameroun: Buea (ZMHU, Berlin).
**aequatorialis** Krauss, 1890 : 663. Holotype ♀, Rolas I. (Gulf of Guinea) (SMN, Stuttgart).

**arabica arabica** Uvarov, 1936 : 534. Holotype ♂, SAUDI ARABIA: S. Hedjaz, Taif (BMNH, London).
**arabica media** Uvarov, 1936 : 535. 3 ♂ syntypes, SAUDI ARABIA: El Kubar (BMNH, London).
**arabica reducta** Uvarov, 1936 : 536. Holotype ♂, SOUTH ARABIA: Hadramaut, Wadi Humum, nr. Makalla (ZM, Hamburg).
**brevicollis** Stål, 1876 : 61. Holotype ♀, SOUTH WEST AFRICA: Ovambo (NR, Stockholm).
**canaliculata** Karsch, 1890*b* : 261. Holotype ♂, CAMEROUN: Kribi (ZMHU, Berlin).
**cereris** Stål, 1856 : 170 (*Phylloptera*). Holotype ♂, SOUTH AFRICA: Natal, Durban (NR, Stockholm).
**compressa** Walker, 1869 : 386 (*Orophus*). Holotype ♂, SOUTH AFRICA (BMNH, London).
**cuspidata** Krauss, 1901 : 292. 1 ♂ syntype, SOUTH WEST AFRICA: Okahandja; 1 ♂ syntype, SOUTH WEST AFRICA: Windhoek (SMN, Stuttgart).
**darlingi** Uvarov, 1936 : 536. Holotype ♂, SOUTH YEMEN: Makhnung (BMNH, London).
**diminuta** Chopard, 1938 : 121. Holotype ♂, KENYA: Turkana Desert, Lodwar (MNHN, Paris).
**fallax** Brunner, 1883 : 248 (*Myrmecophana*). Nymphal holotype, sex unknown, SUDAN: Ambucarra (IRSNB, Brussels).
**montana** Sjöstedt, 1901. Holotype ♀, CAMEROUN: Mapanja (NR, Stockholm).
**mutica** Karsch, 1892 : 327. Holotype ♀, CAMEROUN: Barombi (ZMHU, Berlin).
**ornatipes** Karsch, 1890*b* : 260. Holotype ♂, CAMEROUN: Kribi (ZMHU, Berlin).
**proserpinae** Brunner, 1878 : 274. Holotype ♀, SOUTH AFRICA: Natal, Durban (NM, Vienna).
**punctipennis** Chopard, 1938 : 121. Holotype ♀, KENYA: Mt. Elgon (MNHN, Paris).
**securifera** Brunner, 1878 : 275. Holotype ♂, SOUTH WEST AFRICA: Herrero-Land (NM, Vienna).
**simillima** Chopard, in Chopard & Kevan, 1954 : 330. Holotype ♂, KENYA: N. Turkana, Lokitaung (BMNH, London).
**spinulosa** Karsch, 1889 : 455. Holotype ♀, CONGO (KINSHASA): Kuako to Kimpoko (ZMHU, Berlin).
**strangulata** Walker, 1869 : 385 (*Orophus*). 1 ♀ syntype, SIERRA LEONE; 1 ♀ syntype, "WEST AFRICA" (BMNH, London).
**stylata** Stål, 1873 : 43. Holotype ♂, SIERRA LEONE (NR, Stockholm).
**sudanensis** Giglio-Tos, 1907 : 18. Holotype ♂, SUDAN: Port Sudan (IMZU, Turin).
**varia** Brunner, 1891 : 136. 1 ♂, 1 ♀ syntypes, TANZANIA: Kilimanjaro (NM, Vienna).
**velicauda** Karsch, 1893 : 131. 1 ♂, 1 ♀, 1 nymphal syntypes, TOGO: Bismarckburg (ZMHU, Berlin).
**zebrata** Bruner, 1920 : 135. Holotype ♀, CAMEROUN: Lolodorf (ANS, Philadelphia).

## *GABONELLA* Uvarov

*Gabonia* Bolívar, 1906 : 327. Type-species: *Gabonia cothurnata* Bolívar, by monotypy. (Homonym of *Gabonia* Jacoby, 1893 : 101.)
*Gabonella* Uvarov, 1940*a* : 174 (proposed as replacement name for *Gabonia* Bolívar).

**cothurnata** Bolívar, 1906 : 328 (*Gabonia*). 2 ♂, 3 ♀ syntypes, CAMEROUN (IEE, Madrid).

## *GELATOPOIA* Brunner

*Gelatopoïa* Brunner, 1891 : 111. Type-species: *Gelatopoia bicolor* Brunner, by monotypy.
*Gelatopoia* Brunner, Bolívar, 1906 : 349.
*Gelatopoea* Kirby, 1906 : 439. (Unjustified emendation.)

**bicolor** Brunner, 1891 : 112. Holotype ♂, SIERRA LEONE (IZPAN, Warsaw).

## *GOETIA* Karsch

*Goëtia* Karsch, 1892*a* : 322. Type-species: *Goetia galbana* Karsch, by monotypy.
*Goetia* Karsch, Kirby, 1906 : 428.

***dimidiata*** Bolívar, 1906 : 335. 1 ♂, 1 ♀ syntypes, CAMEROUN; 1 ♂, 1 ♀ syntypes, FERNANDO POO; 1 ♂, 1 ♀ syntypes, no data (IEE, Madrid).
***galbana*** Karsch, 1892*a* : 323. Holotype ♀, CAMEROUN: Barombi (ZMHU, Berlin).

## *GONATOXIA* Karsch

*Gonatoxia* Karsch, 1889 : 441. Type-species: *Gonatoxia immaculata* Karsch, by subsequent designation (Kirby, 1906 : 424).

***immaculata*** Karsch, 1889 : 442. Holotype ♀, TANZANIA: Usambara (ZMHU, Berlin).
***maculata*** Karsch, 1889 : 442. Holotype ♂, SOMALI REPUBLIC (IZPAN, Warsaw).

## *GRAVENREUTHIA* Karsch

*Gravenreuthia* Karsch, 1892*b* : 73. Type-species: *Gravenreuthia saturata* Karsch, by monotypy.

***saturata*** Karsch, 1892*b* : 74. 1 ♂, 2 ♀ syntypes, CAMEROUN : Buea (ZMHU, Berlin).

## *HARPOSCEPA* Karsch

*Harposcepa* Karsch, 1896 : 328. Type-species: *Harposcepa lobulipennis* Karsch, by monotypy. 1896.

***karschiana*** Schulthess, 1898 : 202. Holotype ♀, SOMALI REPUBLIC (or ETHIOPIA?): Gubbet (IZU, Pavia).
***lobulipennis*** Karsch, 1896 : 329. Holotype ♀, SOMALI REPUBLIC (type-depository unknown).

## *HIMERTULA* Uvarov

*Himerta* Brunner, 1878 : 118. Type-species: *Himerta marginata* Brunner, by monotypy (type-locality: India). (Homonym of *Himerta* Foerster, 1868 : 200.)
*Himertula* Uvarov, 1940*a* : 174 (proposed as replacement name for *Himerta* Brunner).

***feana*** Griffini, 1906 : 380 (*Himerta*). Holotype ♂, CONGO (BRAZZAVILLE): Nkogo (MCSN, Genoa).

## *HORATOSPHAGA* Schaum

*Horatosphaga* Schaum, 1853 : 778. Type-species: *Horatosphaga serrifera* Schaum, by monotypy.
*Plegmatoptera* Karsch, 1889 : 429. Type-species: *Plegmatoptera reticulata* Karsch, by monotypy. (Homonym of *Plegmatoptera* Spinola, 1839 : 283.)
*Pantolepta* Karsch, 1889 : 429. Type-species: *Pantolepta heteromorpha* Karsch, by monotypy.
*Pachypyga* Karsch, 1893 : 124. Type-species: *Pachypyga inclusa* Karsch, by monotypy. (Homonym of *Pachypyga* Steinheil, 1873 : 564.)
*Euthyphlebia* Schulthess, 1898 : 204. Type-species: *Euthyphlebia parallela* Schulthess (= *Horatosphaga heteromorpha* (Karsch)), by monotypy.

*Thaumatoxenia* Kirby, 1909 : 65. Type-species: *Thaumatoxenia leggei* Kirby, by monotypy.

*Keniacola* Sjöstedt, 1912 : 13. Type-species: *Keniacola gracilis* Sjöstedt, by monotypy.

*Schulthessinia* Sjöstedt, 1912 : 15. Type-species: *Conchotopoda ruspolii* Schulthess, by original designation.

*Pachypygiana* Strand, 1921 : 106 (proposed as replacement name for *Pachypyga* Karsch).

*Eupantolepta* Bolívar, 1922 : 200. Type-species: *Eupantolepta regularis* Bolívar, by monotypy.

*Plegmatia* Uvarov, 1940*b* : 116 (proposed as replacement name for *Plegmatoptera* Karsch).

**concava** Ragge, 1960 : 308. Holotype ♂, UGANDA: Gulu (BMNH, London).

**crosskeyi** Ragge, 1960 : 318. Holotype ♂, NIGERIA: Niger Province, Diko (BMNH, London).

**diminuta** Chopard, in Chopard & Kevan, 1954 : 319 (*Peronura*). Holotype ♂, KENYA: Moyale (BMNH, London).

**elgonis** Chopard, 1938 : 119 (*Peronura*). Holotype ♂, KENYA: Mt. Elgon (MNHN, Paris).

**elongata** Rehn, 1914 : 163 (*Conchotopoda*). Holotype ♂, CONGO (KINSHASA): Usumbura (ZMHU, Berlin).

? *kandti* Rehn, 1914 : 167 (? *Horatosphaga*). Holotype ♀, CONGO (KINSHASA): Lake Kivu (ZMHU, Berlin).

**gracilis** Sjöstedt, 1912: 14 (*Keniacola*). Holotype ♂, KENYA: Mt. Kenya (NR, Stockholm)

**heteromorpha** Karsch, 1889 : 430 (*Pantolepta*). Lectotype ♂, KENYA: Mombasa (ZMHU, Berlin); designated by Ragge (1960 : 298).

*hoehneli* Brunner, 1891 : 44 (*Plegmatoptera*). Holotype ♀, TANZANIA: Kilimanjaro (NM, Vienna).

*parallela* Schulthess, 1898 : 205 (*Euthyphlebia*). Holotype ♂, ETHIOPIA: Dolo (MCSN, Genoa).

*kilimandjarica* Sjöstedt, 1909 : 132 (*Pantolepta*). Lectotype ♂, TANZANIA: Mt. Meru (NR, Stockholm); designated by Ragge (1960 : 298).

*gracilis* Bolívar, 1922 : 198 (*Plegmatoptera*). Holotype ♂, KENYA: Loroghi Mtns. (MNHN, Paris).

**inclusa** Karsch, 1893 : 125 (*Pachypyga*). 1 ♂, 5 ♀ syntypes, TOGO: Bismarckburg (ZMHU, Berlin).

**leggei** Kirby, 1909 : 65 (*Thaumatoxenia*). Lectotype ♂, UGANDA: E. Ruwenzori, Mubuku Valley (BMNH, London); designated by Ragge (1960 : 292).

*robusta* Rehn, 1914 : 156. Holotype ♀, CONGO (KINSHASA): 90 km. W. of Albert-Nyanza (ZMHU, Berlin).

*amplipennis* Rehn, 1914 : 165 (*Conchotopoda*). Holotype ♂, CONGO (KINSHASA): Lake Kivu, Idjwi I. (ZMHU, Berlin).

*affinis* Bolívar, 1922 : 198 (*Peronura*). Holotype ♀, KENYA: Escarpment (MNHN, Paris).

**linearis** Rehn, 1914 : 167 (*Conchotopoda*). Holotype ♂, UGANDA: Mpororo (ZMHU, Berlin).

? *karschi* Rehn, 1914 : 161 (*Pachypyga*). Holotype ♀, CONGO (KINSHASA) : Ruanda, Lake. Mohasi (ZMHU, Berlin).

**longipes** Bolívar, 1922 : 197 (*Peronura*). Holotype ♀, KENYA: Naivasha (MNHN, Paris).

**magna** Ragge, 1960 : 304. Holotype ♂, ETHIOPIA: nr. Scillare (BMNH, London).

**media** Ragge, 1960 : 299. Holotype ♂, ZAMBIA: Lusaka (BMNH, London).

**meruensis** Sjöstedt, 1909 : 130 (*Plegmatoptera*). Lectotype ♂, TANZANIA: Mt. Meru (NR, Stockholm); designated by Ragge (1960 : 311).

**montivaga** Sjöstedt, 1909 : 129 (*Peronura*). Lectotype ♂, TANZANIA: Kilimanjaro (NR, Stockholm); designated by Ragge (1960 : 312).

**nomima** Karsch, 1896 : 327 (*Peronura*). 1 ♂, 2 ♀ syntypes, TANZANIA: Mpwapwa (ZMHU, Berlin).

**nuda** Ragge, 1960 : 309. Holotype ♂, SUDAN: Imatong Mtns., Kippia (BMNH, London).

**regularis** Bolívar, 1922 : 200 (*Eupantolepta*). Holotype ♂, KENYA: S. of Lake Rudolph (MNHN, Paris).

? *reticulata* Karsch, 1889 : 429 (*Plegmatoptera*). Holotype ♀, TANZANIA: Lake Tanganyika (ZMHU, Berlin).

**ruspolii** Schulthess, 1898 : 204 (*Conchotopoda*). Holotype ♂, KENYA: Balessa (MCSN, Genoa).

? *rivae* Schulthess, 1898 : 201 (*Peronura*). Holotype ♀, ETHIOPIA: Dolo (MCSN, Genoa).

*trochlearis* Bolívar, 1922 : 199. Holotype ♂, KENYA: S. of Lake Rudolph (MNHN, Paris).

? *viridis* Chopard, in Chopard & Kevan, 1954: 318 (*Peronura*). Holotype ♀, KENYA: Isiolo distr., Bambota (BMNH, London).

*samburu* Kevan, in Chopard & Kevan, 1954: 320 (*Peronura*). Holotype ♂, KENYA: Samburu (BMNH, London).

**serrifera** Schaum, 1853 : 778. Holotype ♀, MOZAMBIQUE (ZMHU, Berlin).

*vosseleri* Karny, 1910 : 52 (*Pantolepta*). 10 ♂ syntypes, SOUTH WEST AFRICA: Okahandja; 1 ♂ syntype, SOUTH WEST AFRICA: Kung-Buschmannland (ZMHU, Berlin).

*multivenosa* Chopard, 1935 : 2 (*Pantolepta*). Holotype ♂, MOZAMBIQUE: Nova Chupanga, nr. Chemba (MNHN, Paris).

**somali** Schulthess, 1898 : 200 (*Peronura*). Holotype ♀, SOMALI REPUBLIC: Lugh (MCSN, Genoa).

*peeli* Burr, 1900 : 44 (*Rhegmatopoda*). Holotype ♂, SOMALI REPUBLIC: Whardi Datal (UM, Oxford).

**stuhlmanni** Karsch, 1896 : 329 (*Conchotopoda*). Holotype ♂, "AFRICA ORIENTALIS": Buginda (ZMHU, Berlin).

*kasindina* Rehn, 1914 : 160 (? *Horatosphaga*). Holotype ♀, CONGO (KINSHASA): Kasindi (ZMHU, Berlin).

**stylifera** Karny, 1910 : 51 (*Pantolepta*). Holotype ♂, SOUTH WEST AFRICA: Windhoek (ZMHU, Berlin).

**vicina** Chopard, in Chopard & Kevan, 1954 : 318 (*Peronura*). Holotype ♀, KENYA: Marsabit, Chopa Gof (BMNH, London).

## *ITOKIIA* Sjöstedt

*Itokiia* Sjöstedt, 1901 : 10. Type-species: *Itokiia silvarum* Sjöstedt, by monotypy.

**silvarum** Sjöstedt, 1901 : 10. Holotype ♂, CAMEROUN : Itoki (NR, Stockholm).

## *IVENSIA* Bolívar

*Ivensia* Bolívar, 1890 : 218. Type-species: *Ivensia uncinata* Bolívar, by monotypy.

**uncinata** Bolívar, 1890 : 218. Holotype ♂, "Quango" (MLZA, Lisbon).

## *JAPYGOPHANA* Carl

*Japygophana* Carl, 1921 : 301. Type-species: *Japygophana peloti* Carl, by monotypy.

**peloti** Carl, 1921 : 302. Holotype ♂, GABON (MHN, Geneva).

## *KEVANIELLA* Chopard

*Kevaniella* Chopard, in Chopard & Kevan, 1954 : 332. Type-species: *Kevaniella bipunctata* Chopard, by original designation.

**bipunctata** Chopard, in Chopard & Kevan, 1954: 333. Holotype ♂, KENYA: Mandera distr., Rahmu (BMNH, London).

## *LAMECOSOMA* Ragge

*Lamecosoma* Ragge, 1960*a* : 331. Type-species: *Lamecosoma tenuis* Ragge, by original designation.

**inermis** Ragge, 1961*b* : 217. Holotype ♂, KENYA: Nairobi, Karura Forest (BMNH, London).

**tenuis** Ragge, 1960*a* : 332. Holotype ♂, ZAMBIA: Kipundu (MRAC, Tervuren).

## *LEIODONTOCERCUS* Chopard

*Leiodontocercus* Chopard, 1954 : 83. Type-species: *Leiodontocercus angustipennis* Chopard, by original designation.

***angustipennis*** Chopard, 1954 : 84. Holotype ♂, GUINEA: Nimba (MNHN, Paris).
***condylus*** Ragge, 1962*b* : 15. Holotype ♂, CONGO (KINSHASA): Kibali-Ituri, Yindi (MRAC, Tervuren).
***malleus*** Ragge, 1962*b* : 14. Holotype ♂, GHANA: Western Region, nr. Wiawso (BMNH, London).

## *LEPTOPHYES* Fieber

*Leptophyes* Fieber, 1853 : 174. Type-species: *Barbitistes albovittatus* Kollar, by monotypy (type-locality: Austria).

***antinorii*** Bormans, 1880 : 217. Holotype ♀, ETHIOPIA: Shoa (MCSN, Genoa).

## *LETANA* Walker

*Letana* Walker, 1869 : 277. Type-species: *Letana linearis* Walker, by monotypy (type-locality: India).
*Pyrrhicia* Stål, 1873 : 41. Type-species: *Phaneroptera rubescens* Stål, by original designation (type-locality: Hong Kong).
*Pyrrhizia* Brunner, 1891 : 55. (Unjustified emendation.)

***conradti*** Bolívar, 1906 : 329 (*Pyrrhicia*). Holotype ♂, CAMEROUN (IEE, Madrid).
***zanzibarica*** Brunner, 1891 : 55 (*Pyrrhizia*). Holotype ♂, "ZANZIBAR" (NM, Vienna).

## *MANGOMALOBA* Sjöstedt

*Mangomaloba* Sjöstedt, 1902 : 14. Type-species: *Mangomaloba monticola* Sjöstedt, by monotypy.

***angustipennis*** Chopard, 1958 : 76. Holotype ♂, PRINCIPE (MNHN, Paris).
***latipennis*** Chopard, 1954 : 86. Holotype ♂, GUINEA: Nimba (MNHN, Paris).
***monticola*** Sjöstedt, 1901 : 15. Holotype ♂, CAMEROUN: Mt. Cameroon (NR, Stockholm).
***royi*** Chopard, 1954 : 85. Holotype ♂, GUINEA: Nimba (MNHN, Paris).

## *MELIDIA* Stål

*Melidia* Stål, 1876 : 60. Type-species: *Melidia brunneri* Stål, by monotypy.

***brunneri*** Stål, 1876 : 60. Holotype ♀, SOUTH WEST AFRICA: Damara (NR, Stockholm).
***kenyensis*** Chopard, in Chopard & Kevan, 1954 : 326. Holotype ♀, KENYA: Moyale distr., Yasere (BMNH, London).
***laminata*** Chopard, in Chopard & Kevan, 1954 : 324. Holotype ♂, KENYA: Wajir distr., El Katulo (BMNH, London).

## *MERUTERRANA* Sjöstedt

*Meruterrana* Sjöstedt, 1912 : 10. Type-species: *Meruterrana elegans* Sjöstedt, by monotypy.

***elegans*** Sjöstedt, 1912 : 12. 4 ♂ syntypes, TANZANIA: Mt. Meru (NR, Stockholm).

## *MILITITSA* Burr

*Militítsa* Burr, 1900 : 42. Type-species: *Militítsa somaliensis* Burr, by monotypy.

**somaliensis** Burr, 1900 : 43. Holotype ♀, SOMALI REPUBLIC: Whardi Datal (UM, Oxford).

## *MILTINOBATES* Sjöstedt

*Miltinobates* Sjöstedt, 1901 : 15. Type-species: *Miltinobates blandus* Sjöstedt, by monotypy.

**blandus** Sjöstedt, 1901 : 16. Holotype ♂, "KONGO" (NR, Stockholm).

## *MONTEIROA* Karsch

*Monteiroa* Karsch, 1889 : 458. Type-species: *Monteiroa latifrons* Karsch, by monotypy.

**latifrons** Karsch, 1889 : 458. 1 ♂, 1 ♀ syntypes, MOZAMBIQUE: Delagoa Bay (ZMHU, Berlin).

## *MONTICOLARIA* Sjöstedt

*Monticolaria* Sjöstedt, 1909 : 128. Type-species: *Monticolaria meruensis* Sjöstedt, by PRESENT DESIGNATION.

Both the species listed below were originally included in *Monticolaria* Sjöstedt, but neither was designated as the type-species. I here designate *Monticolaria meruensis* Sjöstedt as the type-species of *Monticolaria* Sjöstedt.

**kilimandjarica** Sjöstedt, 1909 : 129. 2 ♂ syntypes, TANZANIA: Kilimanjaro (NR, Stockholm).
**meruensis** Sjöstedt, 1909 : 128. 10 ♂, 3 ♀ syntypes, TANZANIA: Meru (NR, Stockholm).

## *MORGENIA* Karsch

*Morgenia* Karsch, 1890*b* : 261. Type-species: *Morgenia hamuligera* Karsch, by monotypy.

**hamuligera** Karsch, 1890*b* : 263. Holotype ♂, CAMEROUN : Kribi (ZMHU, Berlin).
**melica** Karsch, 1893 : 196. Holotype ♂, CAMEROUN : Victoria (ZMHU, Berlin).
**modulata** Karsch, 1896 : 340. 1 ♂, 1 ♀ syntypes, CAMEROUN : Lolodorf (ZMHU, Berlin).
**rubricornis** Sjöstedt, 1913 : 4. Holotype ♂, CONGO (KINSHASA): Mukimbungu (NR, Stockholm).
**spathulifera** Griffini, 1908 : 209. 1 ♂ syntype, "Bussanga"; 1 ♀ syntype, CAMEROUN: Mukonje Farm (IRSNB, Brussels).

## *MYLLOCENTRUM* Ragge

*Myllocentrum* Ragge, 1962*b* : 15. Type-species: *Phlaurocentrum stigmosum* Karsch, by original designation.

**stigmosum** Karsch, 1896 : 336 (*Phlaurocentrum*). Holotype ♀, CAMEROUN: Lolodorf (ZMHU, Berlin).

## *ODONTURA* Rambur

*Odontura* Rambur, 1838 : 44. Type-species: *Barbitistes glabricauda* Charpentier, by subsequent designation (Kirby, 1906 : 386) (type-locality: Portugal).

**algerica** Brunner, 1878 : 75. 1 ♂, 1 ♀ syntypes, ALGERIA (NM, Vienna).
**borrei** Bolívar, 1878 : 71. Unknown number of ♀ syntypes, ALGERIA: Constantine Province (IRSNB, Brussels).

**brevis** Werner, 1932 : 114. Holotype ♂, MOROCCO: Ifrane (NM, Vienna).
**capensis** Walker, 1869 : 242. Holotype ♀, SOUTH AFRICA (BMNH, London).
**liouvillei** Werner, 1929 : 184. Unknown number of ♂ syntypes, MOROCCO: nr. Tiflet, Mamora Forest; 1 ♂ syntype, MOROCCO: Malay Idris (NM, Vienna).
**maroccana** Bolívar, 1908 : 333 (as var. of *Odontura spinulicauda*; raised to sp. by Bolívar, 1914 : 237). 7 ♂, 1 ♀ syntypes, MOROCCO: Marrakesh (IEE, Madrid).
*teknicus* Morales, 1947 : 250 (as subsp. of *Odontura liouvillei*). Holotype ♂, IFNI: Zoco Tlata Sboya (IEE, Madrid).
**microptera** Chopard, 1943 : 107. Holotype ♀, ALGERIA: Ain Mlila (MNHN, Paris).
**moghrebica** Morales, 1950 : 163. Holotype ♂, MOROCCO: Isaguen (IEE, Madrid).
**plasoni** Ebner, 1915 : 419. 3 ♂, 1 ♀ syntypes, TANZANIA: Tassamaganga (NM, Vienna).
**pulchra** Bolívar, 1914 : 237. 3 ♂, 3 ♀ syntypes, MOROCCO: Tangier (IEE, Madrid).
**quadridentata** Krauss, 1893 : xcvi. Unknown number of syntypes of both sexes, ALGERIA: Tessala (type-depository unknown).
*terniensis* Finot, 1893 : xxx. Unknown number of syntypes of both sexes, ALGERIA: Terni, Sebdou and Tlemcen (MNHN, Paris).
**spinulicauda** Rambur, 1838 : 45. Lectotype ♂, SPAIN (IEE, Madrid); designated by Uvarov (1948 : 380).
**stenoxypha** Fieber, 1853 : 187 (*Barbitistes*). Holotype ♀, SICILY (type-depository unknown).
**uvarovi** Werner, 1929 : 184. Holotype ♂, MOROCCO: Fez (NM, Vienna).

## ***OXYECOUS*** Chopard

*Oxyecous* Chopard, 1935 : 4. Type-species: *Oxyecous lesnei* Chopard, by monotypy.

**apertus** Ragge, 1956*b* : 187. Holotype ♂, KENYA: Rabai (BMNH, London).
**lesnei** Chopard, 1935 : 4. Holotype ♂, MOZAMBIQUE: nr. Vile Pery (MNHN, Paris).
**magnus** Ragge, 1956*b* : 188. Holotype ♂, TANZANIA: Kilosa (BMNH, London).
**undulatus** Ragge, 1956*b* : 190. Holotype ♂, UGANDA: Bugoma Forest (BMNH, London).

## ***PARAPYRRHICIA*** Brunner

*Parapyrrhicia* Brunner, 1891 : 149. Type-species: *Parapyrrhicia zanzibarica* Brunner, by monotypy.

**zanzibarica** Brunner, 1891 : 149. Holotype ♀, "ZANZIBAR" (NM, Vienna).

## ***PARDALOTA*** Brunner

*Pardalota* Brunner, 1878 : 133. Type-species: *Pardalota versicolor* Brunner, by monotypy.

**asymmetrica** Karsch, 1896 : 330. 7 syntypes of both sexes, "AFRICA ORIENTALIS CENTRALIS": Kirewia; Itimba; Bundeko; Bugundi; Sossian-Ngoroine, Massai Territory; W. Victoria Nyansa, Ussoga-Uganda (ZMHU, Berlin).
**cloetensi** Griffini, 1908*a* : 77. Holotype ♀, CONGO (KINSHASA): Beni Bendi, Sankuru (IRSNB, Brussels).
**haasi** Griffini, 1908*a* : 76. 2 ♂, 1 ♀ syntypes, CONGO (KINSHASA): Luluabourg (IRSNB, Brussels).
**karschiana** Enderlein, 1907 : 197. 2 ♂ syntypes, TANZANIA: Dar es Salaam (1 in ZMHU, Berlin; 1 in IZPAN, Warsaw).
**reimeri** La Baume, 1911 : 317. 2 ♀, 3 nymphal syntypes, TANZANIA: Lindi (ZMHU, Berlin).
**superba** Sjöstedt, 1913 : 2. Holotype ♂, TANZANIA: Lukuledi (NR, Stockholm).
**versicolor** Brunner, 1878 : 134. Unknown number of syntypes of both sexes, "Chinchoxa in Benguela" (1 ♂ in ZMHU, Berlin; 1 ♂ in NM, Vienna).

## *PERONURA* Karsch

*Peronura* Karsch, 1889 : 426. Type-species: *Peronura clavigera* Karsch, by subsequent designation (Kirby, 1906 : 391).

**clavigera** Karsch, 1889 : 427. 2 ♀ syntypes, KENYA: Mombasa (ZMHU, Berlin).

## *PEROPYRRHICIA* Brunner

*Peropyrrhicia* Brunner, 1891 : 37. Type-species: *Dichopetala massaiae* Bormans, by monotypy.

**cooperi** Uvarov, 1934 : 598. Holotype ♂, ETHIOPIA: Jem-Jem Forest (BMNH, London).
**maculata** Schulthess, 1898 : 198. 1 ♂, 1 ♀ syntypes, ETHIOPIA: Biddwara (MCSN, Genoa).
**massaiae** Bormans, 1880 : 218 (*Dichopetala*). 2 ♂ syntypes (1 nymphal), ETHIOPIA: Let-Marefia (MCSN, Genoa).
**scotti** Uvarov, 1934 : 597. Holotype ♂, ETHIOPIA: between Jem-Jem and Addis Ababa (BMNH, London).

## *PHANEROPTERA* Serville

*Phaneroptera* Serville, 1831 : 158. Type-species: *Gryllus falcata* Poda, by subsequent designation (Hemming, 1944 : 211) (type-locality unknown).
*Anerota* Caudell, 1921 : 488. Type-species: *Gryllus falcata* Poda, by original designation.
*Paranerota* Karny, 1926 : 105. Type-species: *Phaneroptera gracilis* Burmeister, by original designation.
*Euanerota* Karny, 1927 : 12. Type-species: *Phaneroptera brevis* Serville, by tentative original designation (see Ragge, 1956 : 206) (type-locality: Java).

**acaciae** Chopard, in Chopard & Kevan, 1954 : 323. Holotype ♂, KENYA: Mandera distr., Rahmu (BMNH, London).
**africana** Steinmann, 1966: 411. Holotype ♂, GUINEA: Conakry (TM, Budapest).
**albida** Walker, 1869 : 335. Holotype ♂, no data (BMNH, London).
**fragilis** Ragge, 1960*b* : 245. Holotype ♂, ETHIOPIA: Danot (BMNH, London).
**gracilis** Burmeister, 1838 : 690. 1 ♂, 2 ♀ syntypes, JAVA (type-depository unknown).
  *roseata* Walker, 1869 : 343. Holotype ♀, INDIA (BMNH, London).
  *marginalis* Brunner, 1878 : 214. Holotype ♀, SOUTH AFRICA (ZMHU, Berlin).
  *indica* Brunner, 1878 : 215. Lectotype ♂, INDIA: Himalayas (NM, Vienna); designated by Ragge (1960*b* : 250).
  *elongata* Brunner, 1878 : 217. Lectotype ♀, JAVA (ZMHU, Berlin); designated by Ragge (1956*a* : 251).
  *subcarinata* Bolívar, 1900 : 764. Holotype ♂, INDIA: Madura (IEE, Madrid).
**longispina** Ragge, 1956*a* : 244. Holotype ♂, UGANDA: Ruwenzori Range, Kilembe (BMNH, London).
**maculosa** Ragge, 1956*a* : 243. Holotype ♂, CAMEROUN: Lolodorf (ZMHU, Berlin).
**magna** Ragge, 1956*a* : 242. Holotype ♂, UGANDA: Mabira Forest (BMNH, London).
**minima** Brunner, 1878 : 214. Holotype ♂, EGYPT (ZMHU, Berlin).
**nana nana** Fieber, 1853 : 173 (as sp.). Type-locality: PORTUGAL; type-material lost.
  *quadripunctata* Brunner, 1878 : 212. Lectotype ♂, ITALY: Trieste (NM, Vienna); designated by Ragge (1956 : 233).
**nana sparsa** Stål, 1856 : 170 (as sp.). Holotype ♀, SOUTH AFRICA: "Caffraria" (NR, Stockholm).
  *lurida* Walker, 1869 : 339. Holotype ♂, "W. AFRICA" (erroneously cited as "Natal" in original description) (BMNH, London).
  *tetrasticta* Gerstaecker, 1869 : 215. Holotype ♂, TANZANIA: Uru (ZMHU, Berlin).

*conspersa* Stål, 1874 : 29 (apparently proposed unnecessarily as replacement name for *Phaneroptera sparsa* Stål).

*punctulata* Burr, 1900 : 41. Holotype ♂, Somali Republic: Whardi Datal (UM, Oxford).

*tenuicerca* Ramme, 1951 : 348. Holotype ♂, Lebanon: Djezin (ZMHU, Berlin).

***nigropunctata*** Chopard, 1955 : 269. Holotype ♂, South Africa: Cape Province, Drakensbergen, 8 miles E.N.E. of Rhodes (UZI, Lund).

***parva*** Ragge, 1956*a* : 240. Holotype ♂, Congo (Kinshasa): Kasongo (MRAC, Tervuren).

## *PHANEROPTILA* Uvarov

*Phaneroptila* Uvarov, in Uvarov & Popov, 1957 : 363. Type-species: *Phaneroptila insularis* Uvarov, by monotypy.

***insularis*** Uvarov, in Uvarov & Popov, 1957 : 363. Holotype ♂, Socotra: Hijama (BMNH, London).

## *PHAULULA* Bolívar

*Phaula* Brunner, 1878 : 167. Type-species: *Phaula laevis* Brunner, by subsequent designation (Kirby, 1906 : 425) (type-locality: Philippine Is.). (Homonym of *Phaula* Thomson, 1857 : 303.)

*Phaulula* Bolívar, 1906 : 347 (proposed as replacement name for *Phaula* Brunner).

***inconspicua*** Brunner, 1891 : 83 (*Phaula*). Holotype ♀, Cameroun (NM, Vienna).

***lenzi*** Brunner, 1891 : 83 (*Phaula*). Unknown number of ♂ syntypes, Cameroun (Lübeck, museum unknown) and Gabon (NM, Vienna).

## *PHLAUROCENTRUM* Karsch

*Phlaurocentrum* Karsch, 1889 : 445. Type-species: *Phlaurocentrum latevittatum* Karsch, by monotypy.

***latevittatum*** Karsch, 1889 : 446. Holotype ♀, Congo (Kinshasa): Kuako to Kimpoko (ZMHU, Berlin).

***lobatum*** Ragge, 1962*b* : 9. Holotype ♂, Congo (Kinshasa): Eala (MRAC, Tervuren).

***maculatum*** Ragge, 1962*b* : 10. Holotype ♂, Congo (Kinshasa): Mawambi-Irumu (NM, Vienna).

***mecopodoides*** Karsch, 1892*a* : 321. Holotype ♂, Cameroun: Barombi (ZMHU, Berlin).

***tuberosum*** Ragge, 1962*b* : 8. Holotype ♂, Uganda: Mabira Forest (BMNH, London).

***turbatum*** Walker, 1869 : 340 (*Phaneroptera*). Holotype ♂, "Congo" (BMNH, London).

## *PHYSOCORYPHA* Karsch

*Physocorypha* Karsch, 1896 : 344. Type-species: *Physocorypha politurata* Karsch, by monotypy.

***politurata*** Karsch, 1896 : 345. 1 ♀ syntype, Cameroun: Victoria; 1 ♀ syntype, Cameroun: Mundame (ZMHU, Berlin).

## *PLANGIA* Stål

*Plangia* Stål, 1873 : 40. Type-species: *Phylloptera graminea* Serville, by original designation.

***graminea*** Serville, 1839 : 405 (*Phylloptera*). Unknown number of syntypes of both sexes, South Africa: Cape of Good Hope (lost).

*natalensis* Walker, 1869 : 379 (*Phylloptera*). Holotype ♀, South Africa: Natal (BMNH, London).

**karschi** Chopard, 1954 : 44. Holotype ♀, GUINEA: Nimba, Nion (MNHN, Paris).
**laminifera** Karsch, 1896 : 343. Holotype ♀, CAMEROUN: Lolodorf (ZMHU, Berlin).
**nebulosa** Karsch, 1890*c* : 366. Holotype ♀, CAMEROUN: Barombi (ZMHU, Berlin).
**unimaculata** Chopard, 1955 : 271. Holotype ♂, SOUTH AFRICA: Cape Province, Tzitzikama Forest, Storms River Mouth (UZI, Lund).
**villiersi** Chopard, 1954 : 45. Holotype ♀, GUINEA: Nimba (MNHN, Paris).

## *PLANGIODES* Chopard

*Plangiodes* Chopard, in Chopard & Kevan, 1954 : 330. Type-species: *Plangiodes carinatus* Chopard, by original designation.

**carinatus** Chopard, in Chopard & Kevan, 1954 : 330. Holotype ♂, KENYA: Garissa distr., Afwein (BMNH, London).

## *PLANGIOLA* Bolívar

*Plangiola* Bolívar, 1906 : 336. Type-species: *Plangiola herbacea* Bolívar, by monotypy.

**herbacea** Bolívar, 1906 : 337. 2 ♂, 1 ♀ syntypes, CAMEROUN (IEE, Madrid).

## *PLANGIOPSIS* Karsch

*Plangiopsis* Karsch, 1889 : 459. Type-species: *Plangiopsis semiconchata* Karsch, by monotypy.

**adeps** Karsch, 1896 : 338. 2 ♀ syntypes, CAMEROUN: Lolodorf (ZMHU, Berlin).
**foraminata** Karsch, 1892*a* : 324. Holotype ♂, CAMEROUN: Barombi (ZMHU, Berlin).
**schoutedeni** Griffini, 1908 : 218. Holotype ♀, CAMEROUN: Mukonje Farm (IRSNB, Brussels).
**semiconchata** Karsch, 1889 : 460. Holotype ♀, CAMEROUN: Barombi (ZMHU, Berlin).

## *POECILOGRAMMA* Karsch

*Poecilogramma* Karsch, 1887*b* : 52. Type-species: *Poecilogramma striatifemur* Karsch, by subsequent designation (Kirby, 1906 : 405).

**annulifemur** Karsch, 1887*b* : 53. 2 ♂, 3 ♀ syntypes, TANZANIA: Kawende (ZMHU, Berlin).
**striatifemur** Karsch, 1887*b* : 53. 2 ♂ syntypes, KENYA: Mombasa (ZMHU, Berlin).

## *POREUOMENA* Brunner

*Poreuomena* Brunner, 1878 : 187. Type-species: *Poreuomena africana* Brunner, by monotypy.

**africana** Brunner, 1878 : 187. Holotype ♂, GABON (MHN, Geneva).
**duponti** Griffini, 1908*a* : 84. 1 ♂, 6 ♀ syntypes, CAMEROUN: Mukonje Farm (IRSNB, Brussels).
**forcipata** Sjöstedt, 1901 : 12. Holotype ♂, CAMEROUN (NR, Stockholm).
**gladiator** Bolívar, 1906 : 337. Holotype ♂, CAMEROUN (IEE, Madrid).
**lamottei** Chopard, 1954 : 40. 1 ♂ syntype, GUINEA: Nimba, N'Zo; 1 ♀ syntype, GUINEA: Nimba, Yalanzou (MNHN, Paris).
**wilverthi** Griffini, 1908*a* : 85. Holotype ♂, CONGO (KINSHASA): Umangi (IRSNB, Brussels).

## *PREUSSIA* Karsch

*Preussia* Karsch, 1890*c* : 364. Type-species: *Preussia lobatipes* Karsch, by monotypy.

**lobatipes** Karsch, 1890*c* : 365. Holotype ♀, CAMEROUN: Barombi (ZMHU, Berlin).

## *PRONOMAPYGA* Rehn

*Pronomapyga* Rehn, 1914 : 171. Type-species: *Pronomapyga grandis* Rehn, by original designation.

**grandis** Rehn, 1914 : 172. Holotype ♂, "OST-AFRIKA" (ZMHU, Berlin).
**graueri** Rehn, 1914 : 171. Holotype ♀, "OST-AFRIKA" (ZMHU, Berlin).

## *PROSPHAGA* Ragge

*Prosphaga* Ragge, 1960*a* : 322. Type-species: *Pantolepta calaharica* Karny, by original designation.

**calaharica** Karny, 1910 : 52 (*Pantolepta*). Holotype ♂, SOUTH AFRICA: Bechuanaland, Kalahari, Ku Gudie, nr. Pitsani (ZMHU, Berlin).
**splendens** Ragge, 1960*a* : 324. Holotype ♂, ETHIOPIA: Wardere (BMNH, London).

## *PSEUDOPYRRHIZIA* Brunner

*Pseudopyrrhizia* Brunner, 1891 : 110. Type-species: *Pseudopyrrhizia punctata* Brunner, by monotypy.

**punctata** Brunner, 1891 : 110. Holotype ♂, "ZANZIBAR" (NM, Vienna).

## *SCHUBOTZACRIS* Rehn

*Schubotzacris* Rehn, 1914 : 169. Type-species: *Schubotzacris producta* Rehn, by original designation.

**producta** Rehn, 1914 : 169. Holotype ♂, CONGO (KINSHASA): Mboga (ZMHU, Berlin).

## *STENAMBLYPHYLLUM* Karsch

*Stenamblyphyllum* Karsch, 1896 : 326. Type-species: *Stenamblyphyllum dilutum* Karsch, by monotypy.

**dilutum** Karsch, 1896 : 327. Lectotype ♀, CAMEROUN: Victoria (ZMHU, Berlin); designated by Ragge (1962*a* : 309).

## *SYMMETROPLEURA* Brunner

*Symmetropleura* Brunner, 1878 : 245. Type-species: *Symmetropleura laevicauda* Brunner, by subsequent designation (Kirby, 1906 : 446) (type-locality: South America, "Bahia").
*Cameronia* Karsch, 1889 : 450. Type-species: *Symmetropleura africana* Brunner, by monotypy. (See p. 77.)

**africana** Brunner, 1878 : 246. Holotype ♂, "CONGO" (NM, Vienna).
**plana** Walker, 1869 : 339 (*Phaneroptera*). Holotype ♂, SOUTH AFRICA: Natal (BMNH, London).

## *TAPIENA* Bolívar

*Tapeina* Brunner, 1878 : 163. Type-species: *Tapeina acutangula* Brunner, by monotypy (type-locality : India). (Homonym of *Tapeina* Le Peletier & Serville, 1828 : 545.)
*Tapiena* Bolívar, 1906 : 334 (proposed as replacement name for *Tapeina* Brunner).

**minor** Bolívar, 1906 : 334. Holotype ♀, GHANA: "Ashante" (IEE, Madrid).

## *TERPNISTRIA* Stål

*Terpnistria* Stål, 1873 : 42. Type-species: *Phaneroptera zebrata* Serville, by original designation.

**lobulata** Stål, 1876 : 61. Holotype ♀, SOUTH WEST AFRICA: Ovambo (NR, Stockholm) (the additional citation of "Caffraria" is probably erroneous).
**tuberculata** Chopard, in Chopard & Kevan, 1954 : 326. Holotype ♂, KENYA: Northern Frontier Distr., Garissa (BMNH, London).
**zebrata** Serville, 1839 : 424 (*Phaneroptera*). Holotype ♂, SOUTH AFRICA: Cape of Good Hope (lost).

## *TETRACONCHA* Karsch

*Tetraconcha* Karsch, 1890*a* : 61. Type-species: *Tetraconcha fenestrata* Karsch, by monotypy.
*Tellidia* Bolívar, 1893 : 177. Type-species: *Tellidia longipes* Bolívar, by monotypy.

**banzyvilleana** Griffini, 1909 : 11. Holotype ♀, CONGO (KINSHASA): Banzyville, Jusoro (MRAC, Tervuren).
**fenestrata** Karsch, 1890*a* : 62. Holotype ♂, CAMEROUN (ZMHU, Berlin).
**longipes** Bolívar, 1893 : 178 (*Tellidia*). Holotype ♀, IVORY COAST: Assinie (IEE, Madrid).
**smaragdina** Brunner, 1891 : 116. Holotype ♂, CAMEROUN (Lübeck, museum unknown).
**stichyrata** Karsch, 1890*c* : 360. Holotype ♂, CAMEROUN: Barombi (ZMHU, Berlin).
*scalaris* Brunner, 1891 : 116. Holotype ♂, GABON (NM, Vienna).

## *TRIGONOCORYPHA* Stål

*Trigonocorypha* Stål, 1873 : 39. Type-species: *Locusta crenulata* Thunberg ( = *Trigonocorypha unicolor* (Stoll)), by original designation (type-locality unknown).

**tihamae** Uvarov, 1952 : 177. Holotype ♂, SAUDI ARABIA: near Qunfida, Wadi Qanuna (BMNH, London).

## *TROPIDONOTACRIS* Chopard

*Tropidonotacris* Chopard, in Chopard & Kevan, 1954 : 321. Type-species: *Tropidonotacris carinata* Chopard, by original designation.

**amabilis** Ragge, 1957 : 121. Holotype ♂, ETHIOPIA: Ual Ual (BMNH, London).
**carinata** Chopard, in Chopard & Kevan, 1954 : 322 (as *Tropidonotacris carinatus*; corrected by Ragge, 1957 : 119). Holotype ♂, KENYA: Mandera distr., Takabba (BMNH, London).
**grandis** Ragge, 1957 : 122. Holotype ♂, TANZANIA: Little Mahenge (BMNH, London).

## *TROPIDOPHRYS* Karsch

*Tropidophrys* Karsch, 1896 : 340. Type-species: *Tropidophrys amydra* Karsch, by monotypy.

**amydra** Karsch, 1896 : 341. Holotype ♂, CAMEROUN: Victoria (ZMHU, Berlin).

## *TYLOPSIS* Fieber

*Centrophorus* Fischer, 1846 : 361. Type-species: *Centrophorus spinosus* Fischer (= *Tylopsis lilifolia* (Fabricius)), by monotypy. (Homonym of *Centrophorus* Müller & Henle, 1837 : 115.)
*Tylopsis* Fieber, 1853 : 172. Type-species: *Locusta lilifolia* Fabricius, by monotypy.

***ampla*** Ragge, 1964 : 315. Holotype ♂, ANGOLA: Moxico distr., upper Mu-Simoj R. (BMNH, London).

***bilineolata*** Serville, [1838]: 419 (*Phaneroptera*). Holotype ♂, SOUTH AFRICA: Cape of Good Hope (lost).

*attenuata* Walker, 1869 : 338 (*Phaneroptera*). Holotype ♀, SOUTH AFRICA (BMNH, London).

*marginata* Brunner, 1891 : 113. Holotype ♀, SOUTH AFRICA: Natal, Durban (NM, Vienna).

***brevis*** Ragge, 1964 : 314. Holotype ♂, CONGO (KINSHASA): Volcan Nyamlagira (MRAC, Tervuren).

***continua*** Walker, 1869 : 337 (*Phaneroptera*). Lectotype ♂, SOUTH AFRICA: Natal, Durban (BMNH, London); designated by Ragge (1964 : 318).

*vicaria* Walker, 1869 : 338 (*Phaneroptera*). Holotype ♂, SOUTH AFRICA: Natal, Durban (BMNH, London).

*longipennis* Stål, 1876 : 58. Holotype ♂, SOUTH WEST AFRICA: Damara (NR, Stockholm).

*vittata* Brunner, 1878 : 229. Lectotype ♂, SOUTH AFRICA: Natal, Durban (NM, Vienna); designated by Ragge (1964 : 318).

*inhamata* Karsch, 1889 : 453. Lectotype ♂, MOZAMBIQUE: Delagoa Bay (ZMHU, Berlin).

***dispar*** Sjöstedt, 1909 : 135. Lectotype ♂, TANZANIA: Mt. Meru (NR, Stockholm); designated by Ragge (1964 : 309).

***dubia*** Giglio-Tos, 1907 : 3. 1 ♂, 1 nymphal syntype, UGANDA: Ibanda; 1 ♀ syntype, UGANDA: Mitiana (IMZU, Turin).

***fissa*** Ragge, 1964 : 312. Holotype ♂, UGANDA: Entebbe (BMNH, London).

***gracilis*** Chopard, in Chopard & Kevan, 1954 : 328. Holotype ♂, KENYA: Mandera distr., Damassa (BMNH, London).

***irregularis*** Karsch, 1893 : 130. Lectotype ♂, TOGO: Bismarckburg (ZMHU, Berlin); designated by Ragge (1964 : 307).

*perpulchra* Burr, 1900 : 43. Holotype ♂, SOMALI REPUBLIC: Whardi Datal (UM, Oxford).

*obscuripes* Chopard, 1945 : 166. Lectotype ♂, CAMEROUN: Bambouto Mtns. (MNHN, Paris); designated by Ragge (1964 : 307).

*villiersi* Chopard, 1950 : 133. Lectotype ♂, NIGER: Agadès (MNHN, Paris); designated by Ragge (1964 : 307).

*lamottei* Chopard, 1954 : 42. Lectotype ♂, GUINEA: Nimba, Serengbara (MNHN, Paris); designated by Ragge (1964 : 307).

***lilifolia*** Fabricius, 1793 : 36 (*Locusta*). Type-locality: ITALY; type-material lost.

*gracilis* Germar, 1817 : 251 (*Locusta*). Holotype ♀, YUGOSLAVIA: Zadar (lost).

*liliifolia* Rambur, 1838 : 44 (*Locusta*). (Unjustified emendation.)

*praeusta* Fischer, 1846 : 142 (*Phaneroptera*). Holotype ♀, U.S.S.R.: Azerbaijan, Kirovabad (lost).

*spinosus* Fischer, 1846 : 362 (*Centrophorus*). Unknown number of nymphal syntypes of both sexes, U.S.S.R.: Crimea (lost).

*margineguttata* Serville, 1839 : 442 (*Phaneroptera*). 1 ♂ syntype, SARDINIA; 1 ♂ syntype, SICILY (lost).

? *coi* Jannone, 1936 : 147. Holotype ♂, DODECANESE: Kos (ILEA, Portici).

***rubrescens*** Kirby, 1900 : 216. Holotype ♂, MALAWI: Zomba (BMNH, London).

*punctulata* Kirby, 1900 : 216. Lectotype ♂, MALAWI: Zomba (BMNH, London); designated by Ragge (1964 : 320).

*meruensis* Sjöstedt, 1909 : 134. Lectotype ♂, TANZANIA: Mt. Meru (NR, Stockholm); designated by Ragge (1964 : 320).

*confluens* Karny, 1915 : 124. Holotype ♀, GUINEA: Upper Niger (NM, Vienna).

## *VOSSIA* Brunner

*Vossia* Brunner, 1891 : 139. Type-species: *Vossia obesa* Brunner, by monotypy.

**obesa** Brunner, 1891 : 140. Holotype ♀, CAMEROUN (NM, Vienna).

## *WEISSENBORNIA* Karsch

*Weissenbornia* Karsch, 1888 : 65. Type-species: *Weissenbornia praestantissima* Karsch, by monotypy.

***praestantissima*** Karsch, 1888 : 66. Holotype ♂, CAMEROUN: Lowry-Criby-Mündung (ZMHU, Berlin).

## *ZEUNERIA* Karsch

*Zeuneria* Karsch, 1889 : 443. Type-species: *Zeuneria melanopeza* Karsch, by monotypy.

***biramosa*** Sjöstedt, 1929 : 40. Holotype ♂, CONGO (KINSHASA): Bas-Uele (MRAC, Tervuren).
***centralis*** Rehn, 1914 : 179. Holotype ♂, CONGO (KINSHASA): Ruwenzori (ZMHU, Berlin).
***longicercus*** Sjöstedt, 1929 : 39. Holotype ♂, CONGO (KINSHASA): Inkisi (MRAC, Tervuren).
***melanopeza*** Karsch, 1889 : 443. Holotype ♀, CAMEROUN: Barombi (ZMHU, Berlin).

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# HYMENOPTERA FROM TURKEY
# SYMPHYTA

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5 JUL 1968
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R. B. BENSON

BULLETIN OF
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ENTOMOLOGY Vol. 22 No. 4
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5 JUL
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BY

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British Museum (Natural History)

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# HYMENOPTERA FROM TURKEY
# SYMPHYTA

*By* R. B. BENSON*

## SYNOPSIS

The Sawflies of Asiatic Turkey and neighbouring countries (from Israel and Cyprus to Transcaucasia and Iran) are listed; over 370 from Asiatic Turkey itself, 50 of these for the first time. Twenty-three new species or subspecies are described and lectotypes designated for seven species. Keys to world species are given for genera or generic-groups centred in this region. The account is based mainly on the collections made in Turkey by Messrs. K. M. Guichard and D. H. Harvey in 1959, 1960 and 1962.

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## INTRODUCTION

A GENERAL account of the fruitful entomological expeditions of Kenneth M. Guichard and David H. Harvey to Turkey in 1959, 1960 and 1962 has already been published (Guichard & Harvey, 1967). In the pages that follow, the numbers given (in parentheses) after the names of the Provinces refer to the Guichard & Harvey (1967) collecting site-numbers. For dates and ecological details of the sites, reference must be made to that paper. The present work on the sawflies, though based mainly on the Guichard and Harvey collections, has been broadened to include material from other countries bordering the eastern Mediterranean, such as that collected by G. A. Mavromoustakis in Cyprus (Benson, 1954), by Dr. Bytinski-Salz and others in Israel (Benson, 1955), by Dr. Zhelochovtsev (1941) and Dr. Dadurian (1958) in Armenia, by G. Heinrich in the Elburz Mountains, N. Iran (Berlin

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* Since the submission of this paper for publication, we learned with deep regret of the death of the author. Certain editorial changes have been made in the paper, which we were unable to submit to him. (*Editor's Note.*)

Museum) and more recently by D. B. Baker on the S. Caspian Coast and Elburz Mountains of N. Iran.

There is no doubt that in collecting this material, the larger and more highly-coloured flower-haunting species have been favoured, whereas most of the small dark inconspicuous species on low plants, as well as those associated with forest trees, have yet to be explored. The most useful approach therefore seemed to be to treat this fauna as though it were an extension of that of C. Europe as described by Enslin (1912–18) and Benson (1951–58), and in the families other than the Tenthredinidae, the Palaearctic fauna described by Gussakovskiĭ (1935 and 1947). References to species given in full by Konow, 1905 or Gussakovskiĭ are not repeated here.

Wherever possible, new keys have been provided to the known world species for the genera centred in the E. Mediterranean: i.e., for *Corynis*, *Tenthredopsis*, *Cuneala*, *Elinora* and *Sciapteryx*.

In *Tenthredo* a key has been constructed to world species-groups, and separate keys to species have been provided for the following species-groups: *bifasciata*, *zonula*, and *maculata-temula*; keys are also provided as follows: *Calameuta* and *Trachelus* species of the E. Mediterranean; the *picipes-ciliatus*-group of *Dolerus*; *Periclista* and the *blanda-duodecimpunctata*- and the *postica*-groups of *Macrophya* in the W. Palaearctic.

I am much indebted to many people who have helped me in this work: especially to K. M. Guichard and D. H. Harvey for their careful attention to collecting sawflies in Turkey, and to D. B. Baker for the great care he has taken in collecting sawflies for me in N. Iran; to Dr. Oehlke of the Deutsches Entomologisches Institut, Eberswald, Germany for his continued kindness in lending me numerous Konow types for study; to Dr. Königsmann of the Zoologisches Museum der Humboldt-Universität zu Berlin for lending me Dr. Heinrich's material from the Elburz Mountains etc.; to Dr. Zhelochovtsev of Moscow for sending in exchange most valuable representatives of species collected by himself in Armenia; to Dr. F. Wolf of the Facultés des Sciences Agronomiques, Gembloux, Belgium, for lending me material collected in Turkey in 1965 by Dr. Demelt.

Unless otherwise indicated, the new Turkish records given below are of specimens collected by Guichard or Harvey in 1959, 1960 or 1962. Those marked with an asterisk (*) are new to the recorded fauna of Turkey and a dagger (†) indicates that the type has been examined in the course of this work.

## XYELIDAE

### **Xyela graeca** J. P. E. F. Stein

*Xyela graeca* J. P. E. F. Stein; Benson, 1958.

TURKEY, C. and W.: Ankara (13), 5 ♀; Izmir (Smyrna).

ALGIERS, AUSTRIA, GREECE, ROUMANIA, TURKEY and ISRAEL.

## PAMPHILIDAE

For a key to the palaearctic species see Gussakovskiĭ 1935.

### ***Acantholyda hieroglyphica*** (Christ)

TURKEY, C.: Ankara (3) 1 ♀; Ankara, Cankaya, 1 ♀, 13.vi.1963 (*H. Özeren*).

EUROPE and TURKEY.

### ***Acantholyda fumata*** (Enslin)

TURKEY, S.: Mersin, Toros Dagi [" Cilicischer Taurus "], (type locality). Endemic.

### ***Cephalcia hartigi*** (Bremi)

C. EUROPEAN ALPS and TRANSCAUCASIA.

### ***Neurotoma fausta*** (Klug)

TURKEY, W.: Bursa, Karacabey, iv–v.1928 (*Ajtai*).

C. and S. EUROPE and TURKEY.

### ***Neurotoma saltuum*** (L.)

TURKEY, N.: Sakarya, Adapazari, on *Prunus armeniaca* L., 2.vi.1957 (*M. Akdogan*).

EUROPE, ASIA MINOR, TURKEY and TRANSCAUCASIA.

### ***Neurotoma nemoralis*** (L.)

TURKEY, C.: Kütakya, Sureya, 1923, on leaves of *Prunus cerasus* L.

EUROPE and TURKEY.

### ***Celidoptera maculipennis*** (J. P. E. F. Stein)

TURKEY, C.: Ankara, Küre Dağ̂, near Bala, 1500 m., 2 ♂, 2 ♀, 10.v.1959, flying round *Prunus spinosa* L. (*E. S. Brown*).

Previously recorded only from TURKEY, W. and C.: Izmir and Amasya Provinces. Endemic.

### ***Pamphilius caucasicus*** Gussakovskiĭ, 1935

TRANSCAUCASIA. Endemic.

### ***Pamphilius trigarius*** Konow

TRANSCAUCASIA. Endemic.

### ***Pamphilius lethierryi*** (Konow)

TRANSCAUCASIA. Endemic.

### ***Pamphilius aurantiacus*** (Giraud)

S. EUROPE and TRANSCAUCASIA.

## MEGALODONTIDAE

The species of this family are found mainly as adults on the flower tables of Umbelliferae, on which plants the larvae feed socially in webs. The species are keyed by Gussakovskiĭ, 1935.

### ***Megalodontes imperialis*** Konow

Israel and Turkey.

### ***Megalodontes phoenicius*** (Lepeletier)

Israel, Syria and Turkey.

### ***Megalodontes kohli*** Konow

Turkey, C. N. and N.E.: Amasya (5); Kayseri (4); Samsun (3); Erzurum (4). 4 ♀.

Crimea and Turkey.

### ****Megalodontes multicinctus*** (Mocsáry)

Turkey, C.: Ankara, Bala district, Ucern, 3 ♀, 28.v.1959 (*E. S. Brown*).

Turkey and Transcaucasia.

### ***Megalodontes exornatus*** (Zaddach)

Hungary, Greece, Turkey and Transcaucasia.

### ***Megalodontes loewi*** (Stein)

Turkey and Transcaucasia.

### ***Megalodontes flabellicornis*** (Germar)

Turkey, C. and N.E.: Nigde (5); Erzurum (1 and 4); Artvin (7). 2 ♂, 8 ♀.

S. Europe and Turkey.

### ***Megalodontes escalerai*** Konow

Lebanon: Djezzine, 1 ♀, 2.vi.1953 (*G. A. Mavromoustakis*).

Lebanon, Israel and Syria.

### ***Megalodontes pectinicornis*** (Klug)

Turkey, C. and S.: Ankara (12); Amasya (5, 7 and 14); Mersin (9). 20 ♂, 35 ♀.

Hungary and Turkey.

### *Megalodontes olivieri* (Brullé)

MESOPOTAMIA.

### *Megalodontes medius* Konow

TURKEY, N.W. and C.: Bursa (4); Corum (2). 2 ♂, 2 ♀.

S.E. EUROPE, TURKEY and TRANSCAUCASIA.

### **Megalodontes laticeps* Konow

TURKEY, C.: Konya, Aksehir, 1 ♀, 1–12.vi.1955 (*Seidenstücker*); Nigde (1). 1 ♀; Kayseri (4), 1 ♀. ISRAEL: Carmel, Place of Sacrifice, 2 ♂, 1 ♀, 26.iii–9.iv.1930 (*Tapuchi*).

S.E. EUROPE, TURKEY and ISRAEL. Not previously recorded outside Europe.

### *Megalodontes flavicornis* (Klug)

TURKEY, N.E.: Artvin (7). 1 ♀; IRAN: Azerbaijan, Bazergan, 1300 m., 1 ♀, 25.v.1960 (*E. S. Brown*).

S.E. EUROPE, TURKEY, TRANSCAUCASIA, N. IRAN and W. TURKMEN.

### *Megalodontes aquilus* Konow

TRANSCAUCASIA.

### **Megalodontes klugi* (Leach)

*Tarpa spissicornis* Klug.

TURKEY, N.W.: Bursa (9). 1 ♂.
C. and S. EUROPE and TURKEY.

### *Tristactus judaicus* (Lepeletier)

*Tarpa judaica* Lepeletier.
*T. caesariensis* Lepeletier.
†*Tristactus punctatus* Konow, **syn. n.**

A series of this species (14 ♂, 11 ♀) from S. TURKEY: Mersin (5) agrees with a series given to the B.M. (N.H.) by Enslin from S. TURKEY: Mersin, Tarsus, 23–24.iv.1955 (*Seidenstücker*) and S.E. TURKEY: Diyarbakir, Ergani (Osmaniye), 5–6.v.1955 (*Seidenstücker*). These all have strongly infuscate wings, the males with a white clypeus and mandibles, and the females with dark mandibles and a variable extension of black on the clypeus; it would not be surprising to find individuals with an entirely black clypeus and *caesariensis* would seem to be just such an aberration. A series from ISRAEL: Mt. Tiberias, 2 ♂, 20.iii.1939 (*Palmoni*), 1 ♂, 14.iv.1963 (*C. H. Andrewes*); Benkamina, 1 ♀, 23–25.iii.1942 and Elon, 1 ♀, 18.v.1946 (*H. Bytinski-*

*Salz*) differ from the form from Turkey in having subhyaline wings. The punctation of the mesonotum is also variable and *T. punctatus* is not clearly differentiated.

TURKEY, SYRIA, ISRAEL.

## XIPHYDRIIDAE

For a key to palaearctic species see Gussakovskiĭ, 1935.

### ***Xiphydria caucasica*** Semenov & Gussakovskiĭ

TRANSCAUCASIA.

## SIRICIDAE

For keys to species see Benson, 1943.

## SIRICINAE

### ***Xeris spectrum*** (L.)

TURKEY, N.E.: Trabzon (14). 3 ♀.

EUROPE to CAUCASUS and ASIA MINOR, SIBERIA and mountains to HEPTAPOTAMIA, SAKHALIN, boreal N. AMERICA and mountains south to COLORADO.

### ***Urocerus augur augur*** (Klug)

*Sirex cedrorum* Smith.
*Urocerus augur bensoni* Maa, 1949, **syn. n.**

TURKEY, N.E.: Artvin (5). 2 ♀ in a timber yard.

Mountains of C. EUROPE, TURKEY and LEBANON.

### ***Urocerus augur sah*** Mocsáry

TURKEY, W.: Izmir, Odemis, Boz Sira Daglari, 1300–1900 m., 1 ♀, 16.viii.1950 (*P. H. Davis*).

Mountains of N. AFRICA, W. TURKEY, TRANSCAUCASIA, N. IRAN, TURKESTAN and AFGHANISTAN.

### ***Urocerus gigas gigas*** (L.)

Occasionally introduced from Europe.

### ***Urocerus gigas argonautarum*** Semenov

TURKEY, N. and N.E.: Bolu (3). 1 ♀; Trabzon (2). 1 ♀ in timber yard.

TURKEY and TRANSCAUCASIA.

### ***Sirex juvencus*** (L).

TRANSCAUCASIA (Dadurian, 1958). Holarctic.

### ***Sirex cyaneus dux*** Semenov

This form agrees with *S. cyaneus* F. in ovipositor/sawsheath ratio and in all other essential characters, but the total ovipositor is longer than in that form and is almost as long as a fore wing (see Benson, 1943). It seems reasonable to treat forms differing only in ovipositor/fore wing ratio in *Sirex* as at most subspecies, as was done by Benson in *Urocerus*. TRANSCAUCASIA.

### ***Sirex noctilio*** F.

TURKEY, S.W.: Denizli, *ex Pinus brutia* Ten, 3 ♂, 2 ♀, x.1962 (*Dr. Hasan Canaksioglu*).

This series of small dark-winged specimens (15–16 mm. long) and a similar series from CYPRUS, x.1927 (*H. M. Morris*) in the B.M. (N.H.) may have been imported.

Temperate EURASIA, introduced into N. AMERICA, NEW ZEALAND and AUSTRALIA.

## TREMECINAE

### ***Tremex jakovlevi*** Semenov

TRANSCAUCASIA.

## ORUSSIDAE

### ***Orussus abietinus*** (Scopoli)

EUROPE, SYRIA and CAUCASUS.

### ****Mocsarya syriaca*** Benson, 1936

The unique original specimen of this species was collected at Akbés (Meidan Ekbes) on the Turkish border of Syria and as it had lost its antennae, its original generic assignment was doubtful. Guichard and Harvey collected a second specimen, 1 ♂ in N. TURKEY: Zonguldak, near Ulus, *c.* 100 m., 17.vii.1962. The possession of antennae with a small scape shows that the species had been correctly assigned to *Mocsarya* rather than to *Chalinus*. The male is only 9 mm., with subhyaline wings, and the carinae within the facial field are incompletely developed, not unnaturally in a small specimen.

SYRIA and TURKEY.

## CEPHIDAE

A classification of the Cephidae was given by Benson (1946) and most of the species from Asia Minor can be named in Gussakovskiĭ's work (1935), but keys to E. Mediterranean *Calameuta* and *Trachelus* are given below.

## HARTIGIINI

### *Hartigia nigra* (Harris)

TURKEY, N.E.: Erzurum (5). 1 ♀.

C. and S. EUROPE and TURKEY.

### *Hartigia linearis* (Schrank)

C. and S. EUROPE, TRANSCAUCASIA, S. SIBERIA.

### [*Janus femoratus* (Curtis)

TURKEY, N.W.: Istanbul (3). 1 ♀. Not recorded yet from Asia Minor.

This specimen differs from the normal C. European form in having a brown instead of yellowish white tegula.

EUROPE.]

### [*Janus compressus* (Fabricius)

TURKEY, N.W.: Istanbul (3). 2 ♀. Likewise not yet recorded from Asia Minor.

S. EUROPE to N. CAUCASUS.]

### *Syrista parreyssii* (Spinola)

TURKEY, N.W., C. and N.E.: Tekirdeg (1); Amasya (3, 4, 5 and 7); Ankara (33); Nigde (5); Erzurum (4). 15 ♂, 12 ♀.

The flight period is from the end of May in Amasya and Nigde, to 23rd July at 2,300 m., Erzurum.

S. EUROPE to CAUCASUS, TURKEY, CYPRUS and ISRAEL.

## PACHYCEPHINI

### *Pachycephus smyrnensis* J. P. E. F. Stein

*Pachycephus brevis* Ghigi, **syn. n.**
†*Spatulocephus sanctus* Pic, **syn. n.**

This species is common and very variable in size (6–11 mm.) and colour pattern. In CYPRUS and ISRAEL it flies in March and April. In TURKEY at Mersin (8), at 600 m. and at Amasya (1, 2 and 3) at 400–500 m., it was found in the last week of May and first week of June. 39 ♂, 50 ♀.

BALKANS, TURKEY, CYPRUS, SYRIA, ISRAEL and TRANSCAUCASIA.

### *Pachycephus aeneovarius* Kohl

This species is very similar to *P. smyrnensis* except that the dark colour of the body has greenish and bluish metallic reflections, and the head and thorax are even more densely punctured.

Only known from TURKEY: Eskischir, Sebandseln (Kohl, 1905). Endemic.

### ***Pachycephus persicus*** Gussakovskiĭ

This species is based on a unique ♂ of 6 mm. length, in which the yellowish white markings are replaced by white. It would seem probable that this is a form of *P. smyrnensis*.

S. IRAN: Luristan, iii.1904.

### [***Pachycephus cruentatus cruentatus*** (Eversmann)

This species is distinguished from the above in: (1) lacking any sign of a genal carina on the lower lateral hind margin of the head capsule; (2) the strongly shining surface of head and thorax with obsolescent punctures; and (3) the deeply infuscate wings.

S. RUSSIA, CRIMEA, N. CAUCASUS].

### ***Pachycephus cruentatus konowi*** Kohl

This subspecies differs from the typical form in having more extensive red colour on the legs. It was described originally from TURKEY: Kayseri, Ereiyas and Dagi, and has also been found in ISRAEL, at Urim.

### ***Characopygus decoratus* sp. n.**

♀. Black with following parts yellow: palps, mandibles (except teeth), fleck in middle of fronto-clypeal area, pronotum, behind, tegula, small fleck on each lateral mesonotal lobe, large fleck on scutellum, upper angle of mesepisternum legs (except most of coxae, trochanters and bases of femora which are black, and the yellow colour is reddish tinged) tergites 6, 7 and 9 almost entirely, 3rd laterally and with medial fleck, and 8th with lateral and medial flecks broad, apical margin of hypopygium, small fleck on the preceding sternite, and lower edge of basal plate flanking the ovipositor. Wings hyaline; stigma, *C* and *Sc* yellow; rest of venation brown to piceous.

Length: 11 mm. (without ovipositor).

*Head* normal, subparallel-sided. Distance between antennal sockets compared to distance between socket and middle of anterior tentorial pit as 1·0 : 0·8. Antenna 22-segmented; becoming clavate from about 7th segment; 10th onwards transverse, and 20th about two and a half times broader than long. POL : OOL : OCL as 1·0 : 1·3 : 1·9.

*Thorax* normal. Legs with hind tarsus about as long as tibia, basitarsus longer than 3 following tarsal segments together. Spurs normal. Inner hind tibial spur longer than apical width of tibia as 1·2 : 1·0. Claws with inner tooth about as long as end tooth, parallel with it but stouter at base.

*Abdomen* with ovipositor about as long as 3 basal hind tarsal segments. Sawsheath at about 45° out of alignment with basal plate and shorter than basal plate as 1·0 : 1·2.

*Punctation* obsolescent on frons, which is shining; temples shining between shallow punctures separated by about two diameters from each other. Mesonotum and mesopleuron with denser punctures separated by about one diameter, but on the front lobes the interspaces between the punctures are dull, with fine surface sculpture and on the scutellum the punctures are shallow and with more widely shining interspaces. Abdomen dull with follicles and fine surface striations.

*Pubescence:* Head and thorax with dense pubescence about as long as diameter of an ocellus, fuscous on the dark surfaces and colourless on the yellow surfaces. Abdomen likewise densely clothed all over with very short pubescence.

♂ as ♀ but lateral lobes of mesonotum entirely black, and abdomen with tergites 4, 6 and 7 almost entirely, 3 laterally, posterior half of 8 and hypopygium and apical segments entirely yellow.

Antenna with 20th segment about × 2 broader than long. Sternite of 8th abdominal segment with an apical fringe of strap-shaped setae; hypopygium normal, drawn out into a narrow tongue-like protuberance, slightly swollen apically, 9 mm.

Holotype ♀. ISRAEL: near Jerusalem, Ejn, Karim, 10.iii.1959 (*H. Bytinski-Salz*). B.M. (N.H.).

Paratype. ISRAEL: Holou, 1 ♂, 28.iii.1959 (*H. Bytinski-Salz*). B.M. (N.H.).

This new species is at once distinguishable from those previously known by its rich yellow markings. None of the other species have any tergites banded right across with yellow, or mesopleurum or scutellum yellow-flecked.

In structure the species are very similar, but the 22-segmented antenna may prove to be characteristic (*C. moricei* Konow and *C. scythicus* Dovnar-Zapolskiĭ have 20 segments and *C. modestus* Dovnar-Zapolskiĭ but 18).

### ***Characopygus scythicus*** Dovnar-Zapolskiĭ

TURKEY: Mersin, Gozne, 1,800 m., 1 ♀, 2.vi.1960 (*Guichard & Harvey*).

Previously known only from S. and S.E. RUSSIA (Askamia-Nova, Sarepta and Orenburg).

## CEPHINI

Attached to wild and cultivated Gramineae.

### ***Cephus pygmaeus*** (L.)

*Cephus tanaiticus* Dovnar-Zapolskiĭ, **syn. n.**
*C. notatus* Kokujer, **syn. n.**

The descriptions of *C. tanaiticus* Dovnar-Zapolskiĭ from S. RUSSIA and *C. notatus* from Transcaucasia agree with melanic forms of this species that I have seen in Britain and elsewhere. Pest of corn and other cultivated grasses.

This species, apart from its introduction into eastern N. AMERICA, occurs throughout EUROPE, west of the Volga and Caspian and south of about 60° lat. and also in N. IRAN, TURKEY, SYRIA and ISRAEL.

### ***Cephus brachycercus*** C. G. Thomson

TURKEY: Samsun (5). 1 ♂.

EUROPE, SIBERIA and TURKEY.

### ***Cephus nigrinus*** C. G. Thomson

SYRIA: Meidan Ekbes (Konow, 1891).

Throughout EUROPE, SYRIA.

### ***Cephus berytensis*** (Pic)

†*Peronistilimorphus berytensis* Pic, 1916.

Type examined 24.iii.1964. ♂. Abdomen and antennae beyond 13th segment are now missing It would appear to be a true *Cephus*, because the distance between the antennal sockets is approximately the same as the distance from a socket to the middle of the anterior tentorial fovea. Antenna swollen from 13th segment. Claws with minute inner tooth. Basal antennal segment yellow and legs entirely yellow except for trochanters and ± coxae.

SYRIA (Beirut).

### ***Species incertae sedis***

*Cephus nigricarpus* André (Syria).

*Cephus obscuriventris* Pic, 1918 (Lebanon) [Type lost. Pin and labels in Paris Mus., seen 24.iii.1964.]

*Cephus politissimus* Costa (Armenia).

## ***CALAMEUTA*** Konow

### KEY TO E. MEDITERRANEAN MALES AND FEMALES

1 *Either* scutellum shining with at most widely spaced punctures, *or* with one or more of the tergites entirely yellow . . . . . . . . . . 2

– Scutellum and whole of mesonotum dull with dense microsculpture. No tergite entirely yellow. Hind tibia normally with 2 preapical spines. Wings subhyaline. No antennal segment transverse. Tergites normally ± margined with yellow apically but may be entirely black. 9–12 mm. ***filiformis*** (Eversmann)

2 (1) Maxillary palp with 5th segment much shorter than 6th (apical) . . . . 3

– Maxillary palp with 5th segment almost as long as 6th.
Very variable in colour but ♀ always has apical tergite yellow and may have other tergites flecked or banded or entirely yellow, but has hind legs entirely black; in ♂ even the hind legs may be ± flecked with yellow on tibia and femur as also may be the face, mesopleura and pronotum. 7–10 mm. ***haemorrhoidalis*** (F.)

3 (2) Larger species (10–15 mm.) with more than one tergite entirely yellow and hind tibia with only one pre-apical spine . . . . . . . . 4

– Smaller species (4–10 mm.) with at most only one tergite entirely yellow or hind tibia with 2 pre-apical spines . . . . . . . . . . 5

4 (3) Wings strongly infuscate. Head, thorax and legs entirely black. Abdomen almost entirely reddish yellow. . . . . . . ***pygmaea*** (Poda)

– Wings subhyaline. Head, thorax and legs ± yellow-marked, abdomen banded yellow and black . . . . . . . . . . ***idolon*** (Rossi)

5 (3) Scutellum impunctate. Abdomen in ♀ entirely black; in ♂ with 4 middle tergites yellow-margined. Hind tibia yellow . . . . . . ***pallipes*** (Klug)

– Scutellum with definite punctures. Abdomen in ♀ with at least apical tergite yellow, and ♂ with middle tergites yellow-margined as in *pallipes*. Hind tibia yellow or ± infuscate. (S.E. EUROPE and S. SIBERIA) ***pravei*** (Dovnar-Zapolskiĭ)

### *Calameuta filiformis* (Eversmann)

*Cephus grombczevskii* Jakovlev, **syn. n.** (Turkestan).
*Cephus infernalis* Dovnar-Zapolskiĭ, **syn. n.** (Caucasus).
*Cephus turanicus* Dovnar-Zapolskiĭ, **syn. n.** (Turkestan bei Taschkent).
*Calameuta amurensis* Gussakovskiĭ **syn. n.** (Amur).

I have representatives of *C. grombczevskii* and *infernalis* named by Gussakovskiĭ and they, together with *C. amurensis*, appear to be melanic forms of *C. filiformis*, *C. infernalis* retaining a yellow fleck on the side of the 5th tergite and *C. grombczevskii* a yellow fleck on the 5th and 6th tergites; *C. infernalis* has, on the contrary, paler hind tibiae than *C. filiformis*. *C. turanicus* appears to be a paler form than *C. filiformis*.

In addition to Europe, Siberia, Transcaucasia, N. Iran and Syria, the species also occurs in Lebanon, where 1 ♂ and 1 ♀ of the typical European form were collected by *G. A. Mavromoustakis* at Hammana, 16.v.1953 and 1 ♂ at Falouka, 17.v.1953.

### *Calameuta haemorrhoidalis* (F.)

†*Cephus gracilicornis* Konow, Caucasus.
*Cephus diversipes* Ghigi, Rhodes.
*Trachelus syriacus* Pic, Syria.
†*Calameuta festiva* Benson, 1954, Cyprus, **syn. n.**

Guichard and Harvey brought back 10 ♂, 17 ♀ of this species from Greece, Thrace and various parts of Turkey, N.W., W., S.W., C., N. and N.E.; Istanbul (3); Bursa (1 and 2); Mugla (7); Antalya (13); Amasya (1 and 7); Ankara (15 and 23); Samsun (6 and 7); Ersurum (8).

Most of them were collected in May and at various altitudes up to 1,800 m., near the summit of Elma Dagi, Ankara on 21.v.1960. The long 5th segment of the maxillary palp distinguishes this species from all other Cephinae, and enables a vast range of colour-pattern forms to be associated here, including the types of *C. festiva* and *gracilicornis*.

S.E. Europe, Turkey, Transcaucasia, Syria, Israel and W. Turkmen.

### *Calameuta pygmaea* (Poda)

This is mainly a species of S.W. Europe and N. Africa but it extends through Egypt to Israel, where 1 ♀ was taken 20.iv.1953 at Wadi Ruaz, Beth Hale rem, Jerusalem (*O. Theodor*) and 1 ♀ at Oqanim, 9.iv.1961 (*Sandler*).

### *Calameuta idolon* (Rossi)

†*Monoplopus apicicornis* Pic, **syn. n.**

Another species varying greatly in the amount of yellow colour on the head and thorax, so that it is not possible to draw any line of distinction from the form described as *apicicornis* with the head mainly yellow. Guichard and Harvey collected

24 ♂, 12 ♀ in Turkey, C.: Ankara (4, 11, 12 and 14) and Amasya (7), mostly from the flowery edges of a lake and streams.

N. Africa, S. Europe to Caucasus, Turkey, Iran, Syria, Lebanon and Israel.

### ***Calameuta pallipes** (Klug)

A ♂ was collected in Turkey: Ankara, 800 m., 22.v.1960 (*Guichard & Harvey*) and 1 ♀ on the Black Sea coast at Samsun, nr. Engiz, 17.v.1959 (*Guichard*). Apart from these two records it has not been found outside Europe.

N. and C. Europe and Turkey.

## ***TRACHELUS*** Jurine

### Key to Mediterranean Males and Females

1 Antenna with pre-apical segments at least × 2 as broad as long. 6–9 mm. . . 2
– Antenna with no antennal segments × 2 as broad as long. 7–14 mm. . . 3
2 (1) Hind tibia without pre-apical spine. ♂ with 3 apical sternites excavated and bearing modified setae. Pronotum ± yellow-flecked. 6–9 mm. ***libanensis*** (André)
– Hind tibia with 1 pre-apical spine. ♂ without modified apical sternites. Pronotum flecked with yellow . . . . . . ***judaicus*** (Konow)
3 (2) Larger species (10–14 mm.). Tibia ± pale, abdomen often with some of the tergites yellow-margined apically . . . . . . . . . 4
– Smaller species (7–10 mm.). Legs entirely black. Abdomen black, with yellow lateral stripe or row of flecks but no tergites yellow-margined apically. Usually 2 pre-apical hind tibial spurs . . . . . . ***tabidus*** (F.)
4 (3) Head capsule and mesonotum (apart from scutellum) entirely black. 1–2 pre-apical tibial spurs present. Cross vein 3 *rm* present in fore wing . . . 5
– Head capsule, and mesonotum richly marked with yellow as also is abdomen. Hind tibiae without pre-apical apurs. Fore wing with vein 3 *rm* missing. (♂ unknown). 12 mm. (Astrachan) . . . . . . ***tigris*** (Benson)
5 (4) Antenna, pronotum, scutellum and abdomen richly marked with yellow. 10–12 mm. (Spain and N. Africa) . . . . . ***flavicornis*** (Lucas)
– Antenna, pronotum and scutellum entirely black, and abdomen with at most apical margins of some of the segments yellow. 10–14 mm. . ***troglodyta*** (F.)

### ***Trachelus judaicus*** (Konow)

†*Monoplopus judaicus* Konow.
†*Monoplopus notaticollis* Pic.
†*Microcephus judaicus* (Konow) Benson, 1935.

This species is very similar to the next following, apart from the characters mentioned in the key, and Benson (1946) concluded that the species belonged to this genus despite its loss of the modified apical sternites in the male.

Israel.

### ***Trachelus libanensis*** (André)

†*Ateuchopus armenius* Konow, **syn. n.**

In a series of over 100 specimens of this species from Cyprus, the pronotum varies from entirely black to mainly yellow and the development of punctures on the mesonotum likewise bridges the gap between the " species " *libanensis* and *armenius*. In the Transcaucasus the pronotum is said to be entirely black, whereas in Israel the pronotum is almost entirely yellow.

The species was found in TURKEY, C.: Yozgat (1) on a flowery hillside at 1,000 m. and at Mersin (14) at 1,600 m., near crops of corn.

TURKEY, CYPRUS, SYRIA, LEBANON and ISRAEL.

### ***Trachelus troglodyta*** (F.)

†*Astatus tenuicornis* Konow, 1902, **syn. n.**

*T. troglodyta* has previously been recorded from only N. and C. EUROPE and is replaced in Transcaucasia by *tenuicornis*. The specimens collected from TURKEY, N. and N.E. at Rize (2) and Samsun (6 and 28) appear to be normal *troglodyta*. They were collected in swampy woods and the borders of marshes.

N. and C. EUROPE, to TURKEY and TRANSCAUCASIA.

### ***Species incertae sedis***

*Cephus* (*Fossulocephus*) *citriniventris* Pic, 1917 (Algeria).

## ARGIDAE

## ARGINAE

For keys to Palaearctic *Arge* species see Gussakovskiĭ, 1935.

### ***Arge ochropus*** (Gmelin)

*Tenthredo rosae* L.; auctt. *nec* L.

TURKEY, N.W., S., C., N., and N.E.: Bursa (2); Bolu (3); Antalya (5 and 6); Ankara (3); Sinop (4); Samsun (10); Amasya (1, 2, 5, 6 and 7); Tokat (4); Adana (3 and 6); Trabzon (3 and 8); Erzurum (6). 12 ♂, 22 ♀, from 4.iv to 16.viii and at altitudes up to 1,700 m.

EUROPE, W. and C. SIBERIA, EGYPT, ISRAEL, LEBANON, SYRIA, TURKEY, CYPRUS, TRANSCAUCASIA, N. IRAN and TURKMEN REPUBLIC.

### ***Arge simulatrix*** Konow

TURKEY, C. and E.: Ankara (32); Amasya (1 and 2); Nigde (5); Gumusane (1). 4 ♂, 9 ♀.

GREECE, SYRIA, TURKEY and TRANSCAUCASIA.

### ***Arge frivaldzkyi*** (Tischbein)

TURKEY, W. and C.: Bursa (4); Ankara (2); Amasya (5 and 7). 6 ♂, 4 ♀.

HUNGARY, GREECE, TURKEY and TRANSCAUCASIA.

### ****Arge beckeri*** (Tournier)

TURKEY, E.: Erzurum (6). 1 ♂, 1 ♀.

S.E. EUROPE and TURKEY.

### ***Arge pyrenaica*** (André)

TURKEY, N.E. and E.: Trabzon (16); and Erzurum (4). 1 ♂, 1 ♀.

Mountains of N. AFRICA, PYRENEES, C. and S. EUROPE, SARDINIA, TURKEY, TRANSCAUCASIA, N. URAL, C. ASIA, MONGOLIA.

### ***Arge pagana*** (Panzer)

EUROPE, TRANSCAUCASIA, SIBERIA, KAMTCHATKA, MONGOLIA, MANCHURIA, N. CHINA and JAPAN.

### ***Arge carinifrons*** Enslin

TRANSCAUCASIA.

### ***Arge persica*** Gussakovskiĭ

N. IRAN.

### ***Arge impressifrons*** Konow

TRANSCAUCASIA and N. IRAN (Talysk).

### ***Arge cyanocrocea*** (Förster)

*Hylotoma syriaca* Mocsáry, **syn. n.**

Benson (1958a) treated *A. syriaca* as a species distinct from *cyanocrocea*, as he found various venational and sculptural differences correlated with the blackened legs of *syriaca*. Much more material shows that these characters are not significantly correlated and that numerous intermediate combinations occur.

In the cooler parts of Europe all the tibiae and basitarsi as well as the hind femur are marked with yellow; in the warmer parts the legs from the front become more extensively blackened and in various parts of the Mediterranean from Spain to Lebanon occur forms with all the legs entirely or almost entirely black. On the S. Caspian Coast in N. IRAN, D. B. Baker has collected a series with still more melanic tendencies: in 26 ♂, 12 ♀, in addition to the legs being black, the wings show a range from normal colouring to almost entire infuscation; and 48 ♂, 9 ♀ have, in addition to entirely black wings, a deeply infuscate abdomen at most only obscurely brownish on the middle segments.

TURKEY, N.W., S.W., S., C., N. and N.E.: Istanbul (2 and 3); Mugla (5 and 10); Mersin (6); Sinop (3); Amasya (14); Samsun (9 and 10); Mersin (6); Rize (8); Artvin (3 and 6). 7 ♂, 25 ♀.

C. and S. EUROPE, LEBANON, SYRIA, CYPRUS, TURKEY, TRANSCAUCASIA, IRAN and TURKMEN.

### ***Arge melanochroa*** (Gmelin)

(Text-fig. 1)

*Hylotoma nigritarsis* Klug, **syn. n.**

In the E. Mediterranean, forms of this species often have the 1st tergite ± infuscate and have been separated as a distinct species (*nigritarsis*) but every intergrade occurs in our series of over 150 specimens. The species is very similar to the following (*scita*) but can be distinguished by the black sawsheath in the ♀ with the large inner teeth, and in the ♂ by the entirely different form of penis-valve (Text-fig. 1); in both sexes also by absence of a continuous longitudinal glabrous patch on the mesosternum.

TURKEY, N.W., S.W., S., C., N., N.E. and E.: Istanbul (1, 2 and 9); Mugla (5); Mersin (6 and 7); Ankara (39, 53 and 54); Amasya (1, 5, 7 and 14); Tokat (3 and 4); Zonguldak (1); Sinop (3 and 4); Giresun (5); Erzurum (4 and 6). 61 ♂, 48 ♀.

C. and S. EUROPE, SYRIA, CYPRUS, TURKEY, TRANSCAUCASIA and IRAN.

### ***Arge scita*** (Mocsáry)

(Text-fig. 2)

*Hylotoma proxima* André, **syn. n.**
†*Arge debilis* Konow, **syn. n.**
*A. zarudnyi* Gussakovskiĭ, **syn. n.**

As in *A. melanochroa*, this species varies in the amount of infuscation of the 1st tergite, and also in whether the anastomosis of *M* with *R* in the fore wing is long or short, so that it is impossible in our long series from Cyprus and Turkey of over 120 specimens to segregate *proxima* and *debilis* from *scita*. From *melanochroa* this species is always to be distinguished in the ♀ by its pale sawsheath with only small inner teeth, in the ♂ by its very characteristic penis-valve (Text-fig. 2) and by the longitudinal glabrous patch on the mesosternum in both sexes.

TURKEY, W., S.W., S., C. and E.: Bursa (69 and 14); Kutahya (11); Mugla (7); Hatay (3); Mersin (6); Nigde (5); Maras (4 and 5); Ankara (3, 4, 17, 53 and 54); Amasya (1, 3, 5, 6, 7 and 8); Tokat (3); Erzurum (4). 32 ♂, 24 ♀. It has been reared from a larva on *Prunus amygdalus* Batsch (CYPRUS: Paphos, vi.1950 (*Th. Shiakides*).

GREECE, ISRAEL, LEBANON, SYRIA, CYPRUS, TURKEY, TRANSCAUCASIA, IRAN and TURKMEN.

### ***Arge cingulata*** Jakoulev

*Arge turanica* Kuznetzov-Ugamskiĭ, **syn. n.**

IRAN: Mazanderan, Panjak Rustaq, 860–1,125 m., 7 ♂, 1 ♀ 23.v.1966 and 7 ♂, 5 ♀, 3.v.1967 (*D. B. Baker*).

TURKESTAN and IRAN.

### ***Arge clavicornis seljuki ssp. n.**

Differs from the closely related *A. clavicornis fuscipes* Fallén in that the infuscate band below the stigma stretches right across the fore wing to the anal margin as in *A. dimidiata* Fallén.

Holotype ♀. TURKEY: Trabzon, Zigana Dagi, 1,400 m., 13.vii.1960 (*Guichard & Harvey*). B.M. (N.H.).

Paratype ♀. Same data. B.M. (N.H.).

The species occurs throughout EUROPE, and in TURKEY, TRANSCAUCASIA, SIBERIA and N. AMERICA.

### ***Arge pallidinervis*** Gussakovskiĭ

TRANSCAUCASIA.

### ***Arge aurata*** (Zaddach)

This species is very closely related to the European *A. ustulata* and *clavicornis* but, apart from its entirely dark legs, the pubescence on its head and thorax is golden instead of silvery.

TURKEY, S. and E.: Nigde, Ciftehan, 900 m., 2 ♂, 26.v.1960 (*Guichard & Harvey*); and Erzurum (6). 1 ♀.

### ***Arge auripennis*** Konow

S.E. EUROPE, SYRIA and TRANSCAUCASIA.

### ***Arge rustica*** (L.)

TURKEY, W., S., C., N., N.E., and E.: Izmit, Alem Deg, 600 m., 1 ♀, 30.vi.1966 (*Demelt*); Antalya (13); Nigde (5); Ankara (41); Amasya (6, 12 and 13); Sinop (2); Samsun (3); Giresun (2); Gumusane (4); Erzurum (6). 22 ♂, 18 ♀.

EUROPE, ISRAEL, TURKEY and TRANSCAUCASIA.

### ***Arge pleuritica*** (Klug)

TURKEY, C., N., and E.: Aydin, Bozdogan, 2 ♂, 12 ♀, iv.1950 (Plant Protection Institute); Amasya (5), 2 ♂, 1 ♀; Erzurum (5 and 6). 2 ♂, 3 ♀.

S.E. EUROPE, TURKEY, TRANSCAUCASIA and TURKESTAN.

### ***Arge berberidis*** (Schrank)

TURKEY, S., C., N.E. and E.: Mersin (13); Ankara (37 and 39); Giresun (5); Gumusane (1 and 5); Erzurum (6). 1 ♂, 9 ♀.

C. and S. EUROPE, TURKEY and TRANSCAUCASIA.

### ***Arge nigripes*** (Retzius)

TURKEY, C., N.E., E.: Ankara (39); Giresun (2); Erzurum (6). 4 ♂, 8 ♀.

EUROPE, TURKEY, TRANSCAUCASIA and SIBERIA.

### ***Arge ciliaris*** (L.)

EUROPE, TRANSCAUCASIA, SIBERIA, MONGOLIA, MANCHURIA.

### ***Arge gracilicornis*** (Klug)

EUROPE, TRANSCAUCASIA, SIBERIA, JAPAN.

### ***Arge enodis*** (L.)

TURKEY, C.: Ankara (35). 1 ♂.

C. and S. EUROPE, TURKEY, TRANSCAUCASIA, SIBERIA and JAPAN.

### ***Kokujewia ectrapela*** Konow

*Kokujewia clementi* Zirngiebl, **syn. n.**
†*Kokujewia palestina* Benson, **syn. n.**

The type of *palestina* was reared from a larva and the supposed differences of the sawsheath and tarsi of the adult were probably due to its teneral condition. *K. clementi* is surely a further synonym, as slight differences of colour are only to be expected.

TURKEY, C.: Ankara, Elma Dagi, 1,700 m., 1 ♂, 28.vi.1959 (*Guichard*); the types of *clementi* were from Konya, Aksehir.

ISRAEL, TURKEY and TRANSCAUCASIA.

## STERICTIPHORINAE

### ***Sterictiphora furcata*** (Villers)

*Hylotoma gastrica* Klug, **syn. n.**
*Schizoceros nigripes* Konow, **syn. n.**
*Schizoceros henschi* (Konow), **syn. n.**
*Schizoceros bleusei* Pic, **syn. n.**

TURKEY, N.W., C., N. and E.: Istanbul (2 and 3); Ankara (39); Amasya (3 and 5); Zonguldak (1); Sinop (4); Erzurum (6). 1 ♂, 9 ♀.

EUROPE, SYRIA, TURKEY, TRANSCAUCASIA and IRAN.

### ***Aprosthema tarda*** (Klug)

TURKEY: Sinop, 1 ♀, 18.vi.1959 (*Guichard*).

Gussakovskiĭ keys 45 palaearctic species of *Aprosthema* (and *Pseudaprosthema*) but most of these are colour forms of a very few genuine species. In Europe and Turkey there are probably only two, *tarda* and *melanura* (see Conde, 1934).

EUROPE, ISRAEL, TURKEY, TRANSCAUCASIA, TURKESTAN, IRAN and SIBERIA.

### ***Aprosthema melanura*** (Klug)

EUROPE to CAUCASUS, TURKESTAN, IRAN and SIBERIA.

## CIMBICIDAE

### ZARAEINAE

To distinguish the species see Benson, 1951 : 39.

***Zaraea aenea*** (Klug)

TURKEY, E.: Trabzon (3). 1 ♀.

C.E. EUROPE, TURKEY and TRANSCAUCASIA.

***Abia sericea*** (L.)

TURKEY, S. and N.: Mersin (4); Samsun (18). 3 ♂, 1 ♀.

EUROPE, TURKEY and TRANSCAUCASIA.

### CIMBICINAE

To distinguish the species see Gussakovskiĭ, 1947.

***Pseudoclavellaria amerinae*** (L.)

TURKEY, E.: Gumusane (5). 5 ♂, 2 ♀.

EUROPE, TURKEY, SIBERIA and COREA.

***Palaeocimbex quadrimaculata*** (Müller)

C. and S. EUROPE, TURKEY and ISRAEL.

### CORYNINAE

#### *CORYNIS* Thunberg

KEY TO MALES AND FEMALES

1 Abdomen and often head and thorax marked with pale colour (yellowish white to orange or red). Claws sub-bifid or with small inner tooth . . . 2

– Body entirely dark, brown or black, at most legs sometimes pale. Claws sub-bifid . . . . . . . . . . . . . . . . 14

2 (1) Face, scutellum, mesopleura as well as abdomen red-marked. Clypeo-frontal area convex above and gibbous in shape . . . **(*sanguinea*-group)** 3

– Pale colour yellow or yellowish white and usually less extensive. Clypeo-frontal area flattened to form straight line in profile . . . . . . 5

3 (2) Mesonotum and tergites covered with widely spaced large punctures with the interspaces shining though pitted with numerous fine punctures . . . 4

– Mesonotum in front, and tergites laterally, densely and coarsely punctured without shining interspaces; scutellum and tergites medially with shining interspaces scarcely larger than diameter of punctures.

Colour red with the following parts black: head apart from face below antennae, a medial and lateral fleck each side of mesonotum together with sunken parts thereof and metanotum, lower mesopleuron and mesosternum, coxae and base of femora, 1st tergite (except laterally) and fore and hind margins of 2nd and 3rd tergites, together with most of sternites. Stigma and rest of wing venation brown. Antennae much longer than greatest eye measure, with club longer than distance between eyes in front. Hind ocelli about as far from eye-margin as from occipital carina (OOL = OOCL). Claws with small inner tooth. Inner front tibial spur almost as long as basitarsus. Pubescence on parts of head, mesonoton and mesopleurum as long as diameter of front ocellus. ♂ not seen. 6 mm. Canary Islands, Morocco and Tunis . . . . . ***sanguinea*** (Snellen van Vollenhoven)

4 (3) Claws sub-bifid. Tibiae and tarsi reddish as femora; tarsi not infuscate apically. Hind ocelli one and one-half times further from eye-margin as from occipital carina (OOL > OOCL).

Colour as in *sanguinea* but the 2nd–5th tergites are marked with black medially though progressively less. ♂ not known. Algeria and Tripolitania . . . . . . . . . . †***semisanguinea*** (Pic, 1916)

– Claws with only minute inner tooth. Tibiae and base of tarsi yellowish white in contrast to the red apex of the femora, and the apical tarsomeres infuscate. Hind ocelli about as far from eye-margin as from occipital carina (OOL = OOCL).

Otherwise coloured as in *semisanguinea* but that the lateral and medial dark flecks on the mesonotum are much enlarged and partially joined and the scutellum is infuscate laterally. 6 mm. ♂ only. Holotype ♂. Israel: Vadi Ajram, 7.v.1954 (*H. Bytinski-Salz*) (in B.M.). Israel ***haematica* sp. n.**

5 (2) Antenna not longer than greatest measure of eye, and club often shorter than distance between eyes in front. Face very flat: clypeo-frontal area below scarcely raised above level of inner orbits. Frontal area of head and thorax almost glabrous; pubescence on post-ocellar region of head much shorter than diameter of front ocellus. Claws sub-bifid. Inner front tibial spur about three-fourths as long as basitarsus . . . . . . . . . . 6

– Antenna at least about one-fourth longer than greatest measure of eye and club often longer than distance between eyes in front. Face with clypeo-frontal area with declivous sides raising it above the level of the inner orbits. Head and thorax pubescent all over and in part at least almost as long as diameter of front ocellus. Claws with small inner tooth or sub-bifid. Inner front tibial spur not more than about two-thirds as long as basitarsus (except in *citrina*) 7

6 (5) Face below antenna, fleck on mesonotum in addition to scutellum and mesopleuron as well as tegula and pronotum yellow. Thorax with shining interspaces between punctures at least as large as punctures on mesopleura and sides of mesonotum. Post-ocellar region ? 5–6 mm. S. and E. Europe (N. to Leningrad) and S.W. Siberia . . . . ♀ ***amoena*** (Klug)

– Head with only clypeus, thorax with only tegula and pronotum, ± yellow. Thorax very densely punctured, without shining interspaces as large as punctures on mesopleura or sides of mesonotum. Post-ocellar region convexly raised above level of hind ocelli. 6–7 mm. S.E. Europe, E. Mediterranean and Turkestan . . . . ***concinna*** (J. P. E. F. Stein)

7 (5) Pronotum and face below antennae ± yellow, or malar space at most two-thirds as long as diameter of front ocellus in ♀ and less than one-half in ♂ . 8

– Pronotum and often face below antennae black. Malar space at least about as long as diameter of front ocellus in ♀ and two-thirds in ♂.

Claws with only small inner tooth. . . . . . . . . . 11

8 (7) Claws bifid . . . . . . . . . . . . . . . . . 9

– Claws with only small inner tooth . . . . . . . . . . 10

9 (8) Fleck on mesopleuron, and abdomen with continuous bands on tergites 1 and 3 or 4 to 7, as well as all the sternites, yellowish white. Mesonotum with

shining surface between large widely-spaced punctures. Hind ocelli further apart than from nearest eye-margin : POL > OOL. 7–8·5 mm. N. Africa and Arabia . . . . . . . . . . . ***citrina*** (Perez)

– Mesopleuron and abdominal sternites all black, and tergites with at most continuous yellow band on 7th segment. Mesonotum dull with rough surface sculpture between the punctures. Hind ocelli as far apart as from nearest eye margin : POL = OOL. 8·5–9 mm. Portugal, Spain, Algeria ***dusmeti*** (Konow)

10 (8) Malar space as long as diameter of front ocellus in ♀ and two-thirds as long in ♂. Pubescence on mesopleura longer than diameter of front ocellus. E. Mediterranean . . . . . . . . . . †***orientalis*** (Konow)

— Malar space only about two-thirds as long as diameter of front ocellus in ♀ and less than half in ♂. Pubescence on mesopleura much shorter than diameter of front ocellus. Spain, Algeria . . . . . . . ***jucunda*** (Klug)

11 (7) Pubescence on mesonotum and mesopleura only about half as long as diameter of an ocellus. Hind ocelli closer to occipital carina than from nearest eye-margin . . . . . . . . . . . . . . 12

— Pubescence on mesonotum and mesopleura in part longer than diameter of an ocellus. Hind ocelli about as far from occipital carina as from nearest eye-margin.

[POL > OOL. Hind ocelli about twice their own diameter from occipital carina.] N. Africa, C. and S. Europe, Transcaucasus and Ukraine ***crassicornis*** (Rossi)

12 (11) Clypeo-frontal area entirely black and its medial groove extends only one-fourth or one-third of way to antennae. POL = or > OOL. Hypopygium (♀) excised on hind margin each side of middle . . . . . . 13

— Clypeo-frontal area marked in front with yellow, and its medial groove extends half way to antennae. POL < OOL. Hypopygium (♀) only slightly emarginate on hind margin each side of middle.

Hind ocelli about twice their own diameter from occipital carina. E. Mediterranean . . . . . . . . . . †***frontina*** (Konow)

13 (12) POL > OOL. Hind ocelli twice their own diameter from occipital carina. Subcosta of fore wing infuscate except at extreme base. E. Mediterranean ***lateralis*** (Brullé)

— POL = OOL. Hind ocelli about one and one-half times their own diameter from occipital carina. Subcosta of fore wing brown except at extreme apex. Spain, N.W. Africa . . . . . . . ***mauritanica*** (Gussakovskiĭ)

14 (1) Legs partly pale . . . . . . . . . . . . . . 15

— Legs entirely black . . . . . . . . . . . . . . 18

15 (14) Pubescence on mesonotum at least as long as diameter of hind ocellus and ± upstanding. Clypeo-frontal area convex and gibbous above. Malar space less than half as long as diameter of front ocellus . . . . . . 16

— Pubescence on head and thorax much shorter than diameter of hind ocellus and prostrate. Clypeo-frontal area with the middle flattened so that it appears as a straight line in profile. Femora mainly black. 7–10 mm. Malar space more than half diameter of front ocellus. ♂ apical tergites unmodified. E. Mediterranean . . . . . . †***similis*** (Mocsáry)

16 (15) Pubescence on mesonotum and head only about as long as diameter of hind ocellus and pubescence on abdomen much shorter than this. Femora black only basally. Tergites scarcely arched longitudinally . . . . . 17

— Pubescence on mesonotum, head and abdomen very coarse and about as long as 4th antennal segment. Femora mainly black. Tergites strongly arched longitudinally. ♂ 8th tergite with apical triangle bearing dense fine pubescence. S.E. Europe and E. Mediterranean . . †***kruperi*** (J. P. E. F. Stein)

17 (16) Mesopleura very densely punctate without shining interspaces. ♂ with unmodified 7th and 8th tergites. E. MEDITERRANEAN . . †***reticulata*** (Benson)

— Mesopleura less densely punctate, so that there are some shining interspaces in the middle as large as punctures. ♂ 7th and 8th tergites with an apical medial triangular area bearing dense long fine hairs. ALGERIA †***andrei*** (Konow)

18 (14) Clypeo-frontal area convex above and concave below . . . . . . 19

— Clypeo-frontal area flattened medially, slightly concave throughout with raised lateral margins.

♀ hypopygium only slightly emarginate laterally. ♂ 7th tergite with medial apical longitudinal line densely pubescent. 5–6 mm. long. S. EUROPE and E. MEDITERRANEAN . . . . . . . . ***italica*** (Lepeletier)

19 (18) Clypeo-frontal area evenly convex above and slightly concave below, showing a curved line in profile. Pubescence of head, thorax and abdomen grey. ♂ apical tergites unmodified. 5·5–7 mm. . . . . . . . 20

— Clypeo-frontal area strongly convex above, gibbous in shape strongly depressed below, angular in profile. Pubescence of head, thorax and abdomen fuscous. ♂ 7th tergite with a medial apical triangular area with dense pubescence. 4·5–6 mm. long. S.E. EUROPE . . . †***atricapilla*** (Mocsáry)

20 (19) Malar space about as long as diameter of front ocellus. ♀ hypopygium with hind margin excised each side. Punctation on mesonotum coarser and more irregular. C. and S. EUROPE and TURKEY . . ***obscura*** (Fabricius)

— Malar space not more than one half as long as diameter of front ocellus. ♀ hypopygium only slightly emarginate each side. Punctation on mesonotum much finer and more regular. S.E. EUROPE, E. MEDITERRANEAN to N. IRAN †***caucasica*** (Mocsáry)

## ***Corynis haematica*** sp. n.

Description and comparison with related species is included in the key above. ISRAEL.

## †***Corynis orientalis*** (Konow)

SYRIA, LEBANON, ISRAEL and IRAQ.

## ***Corynis concinna*** (J. P. E. F. Stein)

*Amasis sarta* Kuznetzov-Ugamskiĭ, **syn. n.**
*A. bleyli* Muche, 1964, **syn. n.**

TURKEY, S., C. and E.: Mersin (6). 1 ♀. Cankiri, Isik Dag, 1,200 m. 1 ♀, 25.vi.1966 (Demelt Coll.); Amasya (5, 6 and 7). 17 ♀; Erzurum (3 and 4). 4 ♀. At flowers of *Potentilla hirta*.

S.E. EUROPE, TURKEY and TRANSCAUCASIA.

## ***Corynis lateralis*** (Brullé)

TURKEY, C. and E.: Ankara (41); Amasya (3 and 7); Artvin (2). 1 ♂, 17 ♀. S.E. EUROPE, TURKEY, TRANSCAUCASIA and S. URAL.

### †*Corynis frontina* (Konow)

TURKEY, S., C., N., N.E. and E.: Mersin (7); Amasya (1, 2, 3, 5 and 7); Ankara (41); Samsun (10); Artvin (2); Gumusane (14). 39 ♂, 27 ♀.

TURKEY and TRANSCAUCASIA.

### *Corynis citrina* (Pérez)

ARABIA: Bahrein Island in Persian Gulf, 1 ♀, 4.iii.1936 (*J. Fernandez*).

ALGERIA, TUNISIA, TRIPOLITANIA and ARABIA.

### †*Corynis similis* (Mocsáry)

IONIAN ISLANDS, CRETE, CYPRUS, SYRIA and ISRAEL.

### †*Corynis kruperi* (J. P. E. F. Stein)

*Amasis enslini* Maidl, **syn. n.**

TURKEY, W. and C.: Bursa (3); Amasya (14). 3 ♂, 3 ♀.

BALKANS, TURKEY, CYRENAICA and TRIPOLITANIA.

### *†*Corynis reticulata* Benson, 1954

TURKEY, C.: Nigde, Ulukisla, 1 ♀, 16–20.v.1955 (*Seidenstücker*).

TURKEY and ISRAEL.

### *Corynis italica* (Lepeletier)

TURKEY, W. and C.: Bursa (9); Amasya (3, 7 and 9). 8 ♂, 8 ♀.

S. EUROPE and TURKEY.

### †*Corynis caucasica* (Mocsáry)

TURKEY, N.W., C. and E.: Edirne (1); Amasya (2, 3, 7 and 9); Trabzon (3 and 15). 26 ♂, 24 ♀.

S.E. EUROPE, TURKEY, TRANSCAUCASIA and IRAN.

### *Corynis obscura* (Fabricius)

TURKEY, N.E., and E.: Trabzon (13); Rize (8); Erzurum (10). 1 ♂, 1 ♀.

EUROPE, TURKEY and TRANSCAUCASIA.

## TENTHREDINIDAE

The notes on the species of this family are intended for use in comparison with the keys given in Benson, 1951–58.

## SELANDRIINAE

For a recent revision of the Palaearctic species of this subfamily see Zhelochovtsev, 1951.

### ***Thrinax caucasica*** Schaposchikov

This species is closely similar to *T. mixta* Klug, but differs in that the edge of the pronotum, tegulae and venation at base of fore wing are red instead of yellowish white, that on the legs the coxae and trochanters are black as well as ± the femora and tibiae, and the frontal area of the head is more transversely wrinkled than in *mixta*.

Turkey, N.E.: Trabzon (17). 2 ♂, 5 ♀.

Turkey and Transcaucasia.

### ***T. macula*** (Klug)

C. and N. Europe and Transcaucasia.

### ***Strongylogaster lineata lineata*** (Christ)

Turkey, N.W., N. and N.E.: Istanbul (2); Sinop (2); Samsun (19); Rize (5). 9 ♀.

Europe, Turkey, Transcaucasia, Iran, Siberia to Japan.

### †***Strongylogaster lineata cypria*** Benson, 1954

This form, only known from Cyprus and Lebanon, has almost entirely yellow legs and entirely black antenna and epipygium (the typical subspecies has black-based femora, and the two basal antennal segments and the epipygium brown).

### ***Aneugmenus padi*** (L.)

*T. coronatus* Klug, **syn. n.**

The only difference that I can discover between *A. padi* and *A. coronatus* is that *A. coronatus* has a small white fleck in the middle of the apical tergites in the ♀. As these two forms occur together over the same range, together with intermediate forms which can only be ascribed arbitrarily, it is unlikely that they are specifically distinct.

Only one form of ♂ is known and this has a large yellow fleck covering the middle of the middle tergites and another covering most of the sternites. The ♂ is also remarkable in having a *sinus sexualis* cutting transversely deeply into the 7th tergite. The male has occasionally been found in Britain, where however the species is at least almost entirely parthenogenetic. In the Mediterranean region, males are more numerous than females.

Turkey, N.W., S., N. and N.E.: Istanbul (2 and 3); Mersin (6); Tokat (1); Samsun (29); Rize (5). 18 ♂, 15 ♀.

Lebanon: Felouka, 5 ♂, 17.v.1953 (*G. A. Mavromoustakis*).

Europe, N. Africa, Turkey and Siberia (introduced into N. America).

### ***Aneugmenus oertzeni*** (Konow)

This species, which I have never seen, is distinguished from *A. padi* by its untoothed tarsal claws. From *A. fuerstenbergensis* it is distinguished in the ♂ by having the 6th tergite emarginate apically and a transverse groove (*sinus sexualis*) across the 7th tergite (as in *A. padi*) and the tergites yellow from the 3rd segment; and in both sexes by the shining surface of the tergites which in *A. fuerstenbergensis* are dull with transverse striations.

CRETE, TURKEY and S.E. EUROPE.

### ***Birka cinereipes*** (Klug)

*Melisandra cinereipes* (Klug) Benson.

TURKEY, N.: Balu (1). 1 ♀.

N. and C. EUROPE, TURKEY and TRANSCAUCASIA.

### ***Mesoselandria morio*** (Fabricius)

*Melisandra morio* (Fabricius) Benson.

TURKEY, C., N., and N.E.: Ankara (39); Sinop (4); Trabzon (3, 7 and 9); Rize (1 and 6). 8 ♀.

EUROPE, TURKEY, TRANSCAUCASIA and SIBERIA.

### ***Selandria serva*** (Fabricius)

†*Selandria serva fuscitarsis* Benson, 1954, **syn. n.**

TURKEY, N.W., C., N. and N.E. and E.: Istanbul (3 and 10); Ankara (15, 34, 39 and 40); Tokat (1 and 3); Samsun (5, 7, 10, 20 and 24); Trabzon (8); Gireson (3); Erzurum (5). Plentiful, 9.v–6.ix, from altitudes up to 1,300 m. in Karagol lake, Ankara. The form with black tarsi does not represent a distinct subspecies as numerous intermediates occur. Gramineae and Cyperaceae.

EUROPE, TURKEY, TRANSCAUCASIA and SIBERIA.

### ***Brachythops flavens*** (Klug)

EUROPE, TRANSCAUCASIA, SIBERIA, N. AMERICA.

### ***Loderus eversmanni*** (Kirby)

TURKEY, N., N.E. and E.: Samsun (5); Trabzon (4); Gumusane (13); Erzurum (13). 1,245–2,000 m., 75 ♂, 15 ♀. *Equisetum.*

EUROPE to CAUCASUS and TURKEY, SIBERIA to JAPAN, and N. AMERICA (polytypic species).

## ***DOLERUS*** Panzer

In the list which follows, a key is given to the species of the *picipes-ciliatus-group*.

### ***Loderus vestigialis*** (Klug)

TURKEY, N.E. and E.: Trabzon (3, 4 and 17); Gumusane (10); Rize (2). 500–1,800 m., 34 ♂, 11 ♀. *Equisetum*.

EUROPE to CAUCASUS and SIBERIA to JAPAN and N. AMERICA (polytypic species).

### ***Dolerus germanicus*** (Fabricius)

TURKEY, C., N.E. and E.: Amasya (2); Trabzon (7 and 9); Rize (5); Gumusane (3); Erzurum (3, 5 and 10). Trabzon and Rize at sea level. 56 ♂, 83 ♀, 19.iv.–20.iv.1959; 40 ♂, 24 ♀, 24.viii.1959. Erzurum and Gumusane, 1,700–2,000 m. 19 ♂, 4 ♀, 31.v.–1.vi.1962.

EUROPE and temperate ASIA. (polytypic species).

The three series from N.E. TURKEY represent the spring and summer flights of a double-brooded mountain form. The lowland form would appear to represent *D. germanicus meridianus* Zhelochovtsev, distinguishable from the mountain form, the S. European *etruscus*, through its yellow labrum and, in the summer females, through its yellow clypeus also. It is not clear whether the lowland and mountain forms are discrete races, kept apart by altitude and differing flying-seasons, or whether blending occurs in intermediate altitudes and seasons. Every intergrade occurs between the two European forms: *germanicus* of W. and C. EUROPE with its hind legs more extensively black than its front legs and frequently with black marks also on front mesonotal lobe and scutellum; and *etruscus* Klug of C. and S.E. EUROPE with its hind legs more extensively yellow than its front legs, and the front mesonotal lobe and scutellum usually entirely yellow.

It would therefore seem very unlikely that the forms *D. germanicus germanicus*, *D. germanicus etruscus* and *D. germanicus meridianus* are discrete subspecies.

### †***Dolerus melanoptera*** Konow

Very closely similar to the preceding but larger (10–11 mm. instead of 7–9 mm.) with head more swollen behind eyes, temples more sparsely punctured, with occipital groove and carina less developed and hind femur and tibia entirely yellow. The ♂ in lacking the black flecks on the apical tergites differs from the form of *germanicus* in E. Mediterranean (some ♂♂ of *germanicus* in Italy and Spain lack these flecks).

From *D. hispanicus* it is distinguished by its partly pale legs and deeply excised clypeus (to depth of at least half the total length of clypeus).

TURKEY, N.W., C. and N.: Edirne (1); Ankara (15, 35 and 36); Amasya (2 and 7); Samsun (20). 24 ♂, 13 ♀.

S.E. EUROPE and TURKEY.

### †*Dolerus hispanicus* Mocsáry

*Dolerus geniculatus* Lepeletier, 1823, *nec* Geoffroy, 1785, **syn. n.**
†*Dolerus nigriceps* Konow, 1891, **syn. n.**
*Dolerus africanus* Forsius, 1919, **syn. n.**

This species is similar to *D. germanicus* in general form and sawsheath, but is larger, with very sparsely punctured head and mesonotum, with poorly developed temporal furrows on head, and the 1st tergite and sawsheath in the ♀ are pale, and the legs entirely black. From both *germanicus* and *melanoptera* it is distinguished by its less deeply excised clypeus (less than half the total clypeal length). The ♂, like the ♀, has the mesonotum mainly yellow and the apex of the abdomen unmarked with black. The palest forms occur in Algeria, where the whole thorax and abdomen above, including 1st tergite in both ♂ and ♀, can be yellow, and only the meso- and metasternum black, but usually the scutellum and the sunken surrounding parts are ± black.

TURKEY, C.: Amasya, 500 m., 1 ♂, 2 ♀, 22.v.–6.vi.1959 (*Guichard & Harvey*).

N.W. AFRICA, SPAIN, TURKEY, TRANSCAUCASIA and N. IRAN.

### *Dolerus aericeps* C. G. Thomson

EUROPE and TRANSCAUCASIA.

### **Dolerus anticus seljuki* ssp. n.

In the ♀, this race is distinguished from the typical race in that the lateral mesonotal lobes are entirely reddish yellow except where they meet medially. In colour therefore these specimens resemble *D. madidus* f. *schulthessi* except that the mesopleuron is entirely black. In form of saw, sawsheath with curved setae, and antenna with 8th segment only twice as long as wide, they are clearly distinguished from *D. madidus*. The ♂ is distinguished from typical *D. anticus* by having the 2nd and 7th tergites unmarked with black.

Holotype ♀. E. TURKEY: Gumusane, Bayburt, 1,600 m., 26.v.1962 (*Guichard & Harvey*); B.M. (N.H.).

Paratypes. TURKEY: N.W., N., N.E. and E.: Edirne, 1 ♀, 6.v.1960 (*Guichard & Harvey*); Samsun, Lake Ladig, 800 m., 1 ♀, 26.vii.1959 (*Guichard*); Erzurum, Ovacik, 2,000 m., 1 ♂, 30.v.1962 (*Guichard & Harvey*); Gumusane, Bayburt, 1,600 m., 1 ♀, 26.v.1962 (*Guichard & Harvey*). B.M. (N.H.).

The species not previously recorded outside Europe.

### *Dolerus triplicatus triplicatus* (Klug)

This subspecies is distinguished from *steini* thus: (1) ♂ colour pattern is different from the ♀, the thorax and 1st tergite being entirely black; and (2) ♀, though similar to *steini*, in having a reddish yellow thorax with a black fleck on each of the mesonotal lobes and a large fleck on the underthorax, covering the mesosternum and much of the mesopleura. This *fleck does not reach the front edge of the mesepisternum*, and the depressed lateral parts of the mesonotum are not infuscate. This subspecies would appear to be the continental part of an atlantic/continental subspecies pair which it forms with *steini*: these two subspecies overlap in TURKEY.

TURKEY, N.W., C. and E.: Edirne (1); Ankara (13); Gumusane (13); Erzurum (7); 1,000 to 1,800 m., 43 ♂, 7 ♀.

SWEDEN, GERMANY, CZECHOSLOVAKIA, AUSTRIA, and N.W., C. and E. TURKEY.

### ***Dolerus triplicatus steini*** (Konow, 1885)

*Dolerus triplicatus* (Klug); Benson, 1952 *nec* Klug.
*Dolerus triplicatus steini* (Konow); Benson, 1966.

This subspecies is the atlantic counterpart of an atlantic-continental subspecies pair which it forms with the preceding subspecies. It is distinguished by the ♂ and ♀ having the same colour pattern, which differs from that of the *triplicatus* ♀ in that the *black fleck on the underthorax reaches right to the front of the mesepisternum* and that depressed lateral parts of the mesonotum are ± infuscate (see fig. 4 in Benson, 1966).

TURKEY, N.E.: Trabzon, Soganli Gecidi, 2,600 m., 1 ♂, 27.vi.1962 (*Guichard & Harvey*); Rize, Sivrikaya, 1,700 m., 1 ♀, 3.vi.1962 (*Guichard & Harvey*).
ENGLAND, SWITZERLAND, ITALY and N.E. TURKEY.

### ***Dolerus puncticollis*** C. G. Thomson

TURKEY, N. and E.: Samsun (12 and 15). 3 ♂, 31 ♀, 1,600–2,390 m., 2–11.iv.1959. Rize (8); Gumusane (3, 10); Erzurum (5, 12 and 14). 26 ♂, 25 ♀, at sea level, 23.v to 3.vi.1962.

EUROPE, ISRAEL and TURKEY.

### [***Dolerus gonager*** (F.)

(Text-fig. 7)

TURKEY, N.W.: Istanbul, Belgrat Orman, 1 ♂, 23.iii.1962 (*Guichard & Harvey*).
EUROPE].

### ***Dolerus montivagus* sp. n.**

(Text-figs. 4, 9)

♀. Black except for the red knees (the extreme apex of all the femora and extreme base of all the tibiae). Pubescence silvery. Wings subhyaline with black venation. *Length:* 9–10 mm.

*Head:* subparallel-sided behind the eyes, which are separated above from the occipital margin by about their own length. Malar space about one-third of inter-antennal line. Clypeus broadly and shallowly emarginate to a depth of only about one-fifth of the clypeal length. Antenna with 8th segment about × 5 as long as basal breadth and 3rd segment longer than greatest measure of an eye as (1·0 : 09). Punctation coarse with several large shining interspaces on temples and notably a large spot as large as 2 or 3 ocelli adjoining each of the lateral ocelli. Occipital furrows not very clearly marked above.

*Thorax:* Mesonotum coarsely and rather irregularly punctured but shining between the punctures; large sparsely punctate shining areas occur each side of the middle line of the front lobes, most of the front and middle of the lateral lobes and the front and middle of the scutellum; post-tergite of scutellum shining without punctures or microsculpture and longer than the shortest measure of a cencher. Mesopleuron coarsely and densely punctured, without interspaces as large as a puncture. Mesosternum with only very shallow fine scattered punctures. Legs normal, with hind tarsus about five-sixths as long as a tibia. Wings normal.

*Abdomen:* Normal but with transversely alutaceous surface sculpture obsolescent on the 1st and middle of the 2nd tergite. Sawsheath in dorsal view long and narrow, but with apical setae much as in *D. puncticollis* (Text-fig. 4).

*Pubescence* silvery all over and up to about as long as × 2 diameter of an ocellus on head and thorax, obsolete on the 2nd, 3rd and 4th tergites and middle of 1st tergite.

♂ as ♀ but head contracted slightly behind eyes, which are separated above from the occipital margin by little more than their own shortest measure, 8th antennal segment only about × 3·5 as long as its basal breadth. Abdomen more pubescent on 1st and middle of 2nd and 3rd tergites, the tergites beyond 4th lacking even the mid-dorsal base line; penis-valve (Text-fig. 9).

Holotype ♀. N.E. TURKEY: Trabzon, Soganli Gecidi, 2,600 m., 26.v.1962 (*Guichard & Harvey*). B.M. (N.H.).

Paratypes. N.E. TURKEY: 3 ♂ (with same data as holotype); Trabzon, Zigana Gecidi, 1,650 m., 13 ♂, 22.v.1962; Trabzon, Hamsikoy, 1,245 m., 1 ♂, 1 ♀, 23–24.v.1962; Rize, Sivrikaya, 1,700 m., 1 ♂, 1 ♀, 3.vi.1962; and Erzurum, Tortum, 1,550 m., 1 ♀, 10.vi.1962 (*Guichard & Harvey*). Total 4 ♀, 18 ♂. B.M. (N.H.).

This species has the sparse punctation of *D. gonager* on the mesonotum, but the narrow sawsheath bears setae more like those of *D. puncticollis*: from both these species though it differs in having a scarcely emarginate clypeus, longer antennae in ♀ (in neither *D. gonager* nor *D. puncticollis* ♀ is the 3rd antennal segment clearly longer than an eye), and in ♂, absence of bare hairless mid-dorsal line on abdomen from 4th tergite, apart from differences in the penis-valve.

## THE *PICIPES–CILIATUS*–GROUP

In S.E. EUROPE, ASIA MINOR and TRANSCAUCASIA there occurs a group of species related to the two last species (*Dolerus gonager* F. and *puncticollis* Thomson) but in which the female sawsheath is sharply expanded behind in dorsal view (see Benson, 1951–58, fig. 198), the legs are often red about the knees (the joint between the femur and the tibia) and the temples have an impunctate spot *c.* × 3 diameter of an ocellus adjoining the postocellar area each side. The males are under 9 mm. and have: (1) *either* the lateral mesonotal lobe punctate at least behind, *or* infuscate pubescence on the head, and (2) *either* very densely pubescent tergites without a bare medial line *or* a clypeus with a much-reduced medial front marginal excision (to less than one-third of total clypeal length). In three of the species the females are ± brachypterous with correlated changes in the mesonotum (flattening and shortening of lobes with obsolescence of suture dividing front pair and shortening of post-tergite of scutellum).

### KEY TO MALES AND FEMALES

1 Wings hyaline and fully-developed in ♂ and ♀. Clypeus apically broadly emarginate to a depth of at least one-third of its total length, with the lateral lobes narrower than the medial emargination. Pubescence on head and thorax silvery . . . . . . . . . . . . . . 2

– Wings infuscate and often brachypterous in ♀. *Either* clypeus with a narrow and shallow excision apically (to a depth not exceeding one-third of its total length and leaving obtuse or truncate lateral lobes) *or* pubescence on head and mesonotum infuscate . . . . . . . . . . . 3

2 (1) Legs not red about the knees (joint between femur and tibia). Head behind the eyes slightly swollen, longer than shortest measure of eye and with occipital furrows obsolescent. ♂ abdomen lacks the medial bare line through the pubescence on tergites 3–8; penis-valve (Benson, 1951–58, fig. 240). Larger species: 7–9 mm. EUROPE . . . . . . . . **picipes** Klug

– Legs red about the knees. Head slightly contracted behind eyes, not longer than shortest eye-measure and with occipital furrows clearly developed. ♂ abdomen with medial bare line through pubescence on tergites 3–8; penis-valve (Text-fig. 5). Smaller species: 7–8 mm. IRAN . **hyrcanus** sp. n.

[*Dolerus vernalis* Ermolenko, 1964 (unique ♀) (Ukraine) would run here and may be synonymous, but has red on front and middle knees limited to apex of femur.]

3 (1) *Either* clypeus excised medially in front to a depth less the diameter of the front ocellus, *or* pubescence on head and wings silvery. ♀ ± brachypterous 4

– Clypeus broadly emarginate in front to a depth of almost one-third of its total length. Upper head and wings with infuscate pubescence. Wings fully-formed in both sexes.

Legs red on the knees. Penis-valve (Text-fig. 6). S.E. EUROPE and TRANSCAUCASIA . . . . . . . . **kokujewi** Konow

4 (3) ♀ wings less than one-half as long as abdomen. At least ♂ with infuscate pubescence on upper head and wings . . . . . . . . 5

– ♀ wings much more than one-half as long as abdomen. Pubescence on head and wings silvery in ♂ and ♀. S.E. EUROPE . . **subalatus** Kirensky, 1926

5 (4) Legs entirely black. ♀ with infuscate pubescence on head and wings. Pubescence on mesopleura shorter than on head and mesonotum, where it is as long as 2nd antennal segment. GREECE (Mt. Parnassus, 2,000 m.) (♂ unknown) . . . . . . . . . . . . **oertzeni** Konow

– Legs with red knees. ♂, but not ♀, with infuscate pubescence on head and wings; ♀ with pubescence on mesopleura as long as that on head and mesonotum, where it is about as long as 2nd antennal segment. S.E. EUROPE and TRANSCAUCASIA . . . . . . . . . . **ciliatus** Konow

## *Dolerus picipes* Klug

EUROPE, TURKEY and TRANSCAUCASIA.

## *Dolerus kokujewi* Konow

(Text-fig. 6)

TURKEY, N.E.: Trabzon, Zigana Gecidi, 1,650 m., 1 ♂, 2.v.1962 (*Guichard & Harvey*).

S.E. EUROPE, TURKEY and TRANSCAUCASIA.

### **Dolerus hyrcanus sp. n.**

(Text-figs. 3, 5)

♂. Black with the knees red (the apical half of the femur and basal fourth of the tibia); pubescence silvery; wings hyaline with black venation. Length 8–9 mm.

*Head:* slightly contracted behind eyes which are separated above from the occipital margin by about their own shortest measure. Malar space about one-half of inter-antennal line. Clypeus broadly emarginate in front to a depth of about one-third of its total length and strongly arched transversely. Antenna with 8th segment about × 4 as long as its basal breadth. Punctation coarse and without interspaces in front of ocelli but the temples adjoining the post-ocellar region each side have an impunctate area as large as 2 to 3 ocelli. Occipital furrows clearly marked.

*Thorax:* front lobes of mesonotum coarsely punctured laterally without interspaces but with the middle half shining with shallow sparse punctures; middle lobes shining with sparse shallow punctures on the front half, widely spaced becoming denser behind; scutellum densely punctured except in front and ± along middle line, and with its post-tergite longer than the shortest length of a cencher and obliquely striated with rugulae. Mesopleura coarsely punctured but with a few impunctate spots in the middle up to about twice the diameter of a puncture. Mesosternum with only very shallow fine scattered punctures. Legs normal with hind tarsus about five-sixths as long as tibia. Wings normal.

*Abdomen* normal with tergites transversely alutaceous; penis-valve as in Text-fig. 5.

*Pubescence* silvery all over; on head and thorax up to about × 2 diameters of ocellus; abdomen with tergites 1–3 ± glabrous laterally, rest of tergites densely clothed except for base medial line.

♀ as ♂ except as follows: 8th antennal segment only × 3 as long as broad at base; hind tarsus only about two-thirds as long as tibia; ovipositor longer than hind femur; sawsheath in dorsal view incrassate apically, where it is twice as broad as at base (Text-fig. 3). Saw as in *D. picipes*.

Holotype ♂. IRAN: Mazandaran, Chalus–Chahsavar coast, 23.iii.1966 (*D. B. Baker*). B.M. (N.H.).

Paratypes. Same locality, 19 ♂, 3 ♀, 25.ii–28.iii (*D. B. Baker*). B.M. (N.H.).

The ♀ is distinguished from other species of the *picipes–ciliatus* group in the key above. The ♂ penis-valve (Text-fig. 5) is unlike that of any other known species but is perhaps most like that of *D. puncticollis* (cf. Benson, 1951–58, fig. 230).

### **Dolerus nigratus** (Müller)

EUROPE and TURKEY (Bytinski-Salz).

### **Dolerus aeneus** Hartig

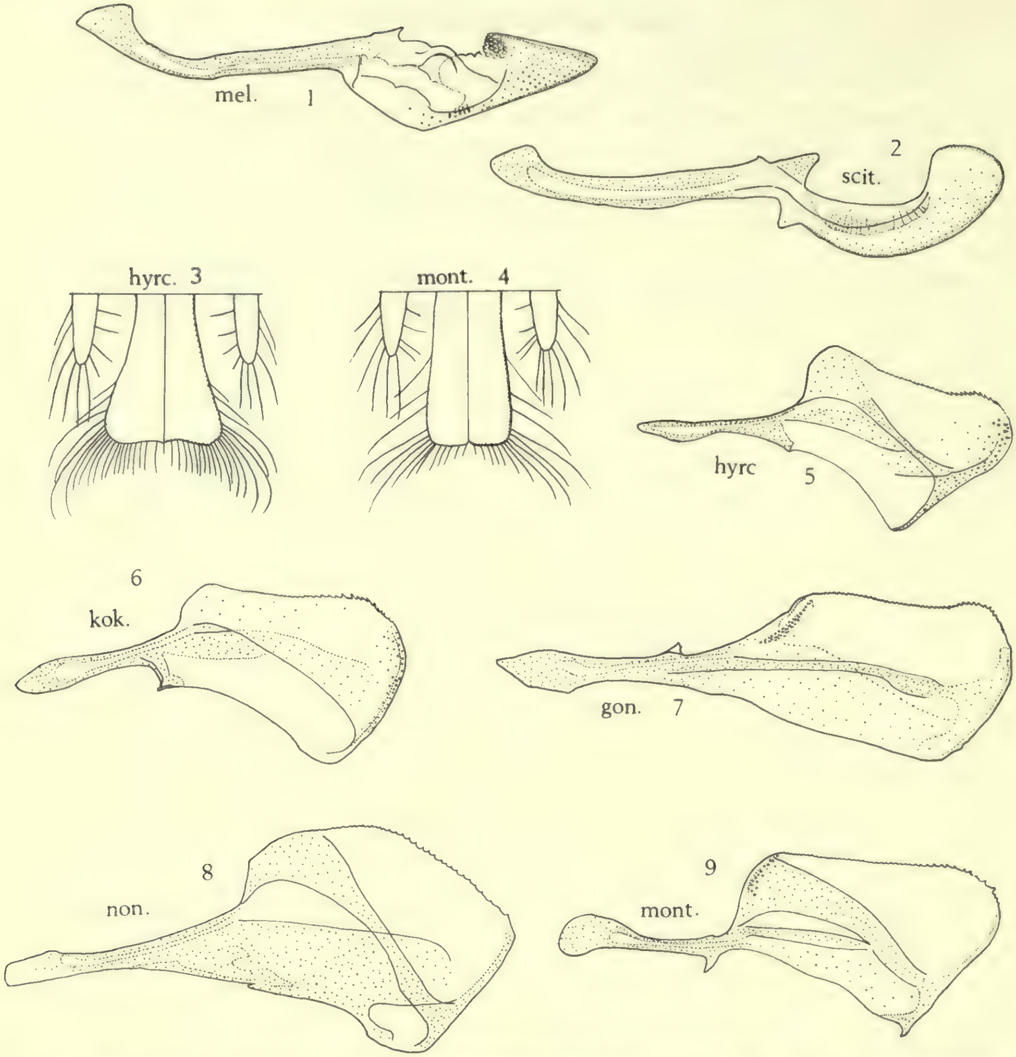
TURKEY: Trabzon, Soganli Gecidi, 2,600 m., 1 ♂, 27.v.1962 (*Guichard & Harvey*); Trabzon (17). 1 ♀.

EUROPE and ASIA MINOR.

### **Dolerus asper** Zaddach

*Dolerus asper megapteroides* Muche ♀, 1964a (*nec* ♂) **syn. n.**

TURKEY, E.: Gumusane (11); Erzurum (7, 12 and 13). 1,800 m., 2,390 m., 5 ♂, 1 ♀, 29.v. to 1.vi.1962; Bolu (*Muche*).



FIGS. 1–9. 1, 2. Penis-valves: 1, *Arge melanochroa*; and 2, *A. scita*. 3, 4. Sawsheaths from above: 3, *Dolerus hyrcanus* sp. n.; 4, *D. montivagus* sp. n. 5–9. Penis-valves: 5, *Dolerus hyrcanus* sp. n.; 6, *D. kokujewi*; 7, *D. gonager*; 8, *D. nonutimus*; and 9, *D. montivagus* sp. n.

The specimens from Gumusane and Erzerum have more infuscate wings than any specimens seen from Europe.

Species from EUROPE, TURKEY and temperate ASIA to KAMTCHATKA.

### ***Dolerus haematodes*** Schrank.

TURKEY, N., N.E. and E.: Samsun (5, 12 and 15); Trabzon (7 and 17); Gumusane (3). Sea level to 1,600 m., 80 ♂, 53 ♀.

In the series from sea level at Samsun, 12 out of 23 ♂ have the female colouring, with red pronotum and tegulae; in the series from Gumusane, at 1,600 m., only 1 out of 58 ♂ have this colouring while 57 ♂, as in typical W. European form, lack any red on pronotum and tegulae.

EUROPE, TURKEY and TRANSCAUCASIA.

### ****Dolerus nonultimus*** Zhelochovtsev, 1941 (with figs.)

TURKEY: Trabzon (4). 1 ♂.

This species belongs to the *anthracinus-nitens* group with sawsheath as in Benson, 1951–58, fig. 196, but has a distinct penis-valve and saw. The male has infuscate pubescence on the upper head but differs from *anthracinus* in having the head strongly contracted behind. The female differs from other known females in the group in having infuscate pubescence on its head as in the male, and from *anthracinus* and *coracinus* differs also in having unmodified front mesonotal lobes.

TURKEY and TRANSCAUCASIA.

### *†***Dolerus megapterus*** Cameron

? *Dolerus asper megapteroides* Muche, 1964a (♂ *nec* ♀).

TURKEY: Gumusane (3). 2 ♂. G. Ovacik, 2,000 m., 4 ♂, 1 ♀, 30.v.1962 (*Guichard & Harvey*); Erzurum (5). 1 ♀.

Not previously recorded from outside EUROPE.

## BLENNOCAMPINAE

## ATHALIINI

Tribe revised by Benson, 1962.

### †***Athalia cuspidata*** Benson, 1954

ISRAEL, endemic.

### †***Athalia dimidiata*** Konow

TURKEY, endemic.

### ***Athalia bicolor*** Lepeletier

TURKEY, N.W., W., C., N., N.E., and E.: Edirne (1); Bursa (4 and 9); Usak (1); Bilecik (2); Samsun (5, 6 and 16); Trabzon (3 and 4); Artvin (4); Erzurum (7). 29 ♂, 2 ♀.

EUROPE, MEDITERRANEAN, TURKEY, TRANSCAUCASIA to TURKMEN REPUBLIC.

### †*Athalia maculata* Mocsáry

TURKEY, N. and C.: Bolu (2); Samsun (30); Amasya (9). 3 ♀.

S.E. EUROPE, TURKEY and TRANSCAUCASIA.

### †*Athalia paveli* Mocsáry

TURKEY, endemic.

### †*Athalia rufoscutellata* Mocsáry

TURKEY, W., C., N.E. and E.: Bursa (3, 9); Ankara (11); Corum (2); Samsun (2); Artvin (4); Gumusane (11). 5 ♂, 7 ♀.

C. and S.E. EUROPE, TURKEY and TRANSCAUCASIA.

### †*Athalia glabricollis glabricollis* C. G. Thomson

TURKEY, W., S.W., C., N.E. and E.: Bursa (3); Mugla (7 and 8); Ankara (3, 11, 14 and 63); Amasya (12); Trabzon (9); Erzurum (1); Kars (11). 12 ♂, 15 ♀.

All EUROPE, MEDITERRANEAN and TURKEY.

### †*Athalia glabricollis meridiana* Benson, 1954

This subspecies is distinguished from the preceding in having more than half the *Costa* from the base yellow in the fore wing.

It is known only from ISRAEL and S.W. IRAN (Benson, 1962, was wrong in ascribing material from GREECE and TURKEY to this form).

### *Athalia ahngeri* Kokujev

TURKEY, C. and E.: Nigde (5); Gumusane (15). 2 ♀.

Steppe species. ISRAEL, TURKEY, TRANSCAUCASIA and MESOPOTAMIA to TURKMEN, UZBEK REPUBLICS and AFGHANISTAN.

### *Athalia circularis circularis* Klug

TURKEY, N.W., W., S., N., C. and N.E.: Istanbul (3 and 9); Mugla (7); Bolu (3); Zonguldak (1); Mersin (7); Sinop (4); Samsun (5, 10, 19 and 21); Corum (2); Amasya (3 and 5); Tokat (1); Trabzon (14 and 15); Artvin (6); Rize (6). 21 ♂, 2 ♀.

Females of the summer flight in the mountains and to a lesser extent those of the autumn flight at sea level have the scutellum and sides of the mesonotal lobes ± yellow (e.g., from Samsun, Kundaz Ovacik, at 1,300 m., 22.vii.1959 and Samsun, Engiz at sea level, 22.ix.1960).

Typical form from EUROPE and MEDITERRANEAN; replaced by ssp. *melanoptera* Benson in E. SIBERIA, JAPAN and mountains of C. ASIA (Kopet Dag and Afghanistan to the Pamirs, Altai and W. Himalayas).

### ***Athalia cordata*** Lepeletier

TURKEY, W., S.W., N., N.E. and E.: Kutahya (5); Bursa (3); Aydin (2); Mugla (1 and 9); Bolu (3); Samsun (15); Giresun (7); Trabzon (3, 4 and 14); Rize (3); Kars (1 and 9). 15 ♂, 15 ♀.

EUROPE, MEDITERRANEAN and TURKEY.

### †***Athalia rosae rosae*** (L.)

TURKEY, N.W., W., S., N., N.E. and E.: Istanbul (3); Kutahya (3 and 10); Mersin (2); Adana (3); Antakya (6); Samsun (5, 6, 19, 20 and 21); Trabzon (9); Rize (1); Gumusane (4); Kars (1 and 7). 8 ♂, 12 ♀.

EUROPE, MEDITERRANEAN, ISRAEL to IRAN; S.W. SIBERIA and N.W. CHINA. Replaced by ssp. *ruficornis* in E. ASIA.

### ***Athalia liberta liberta*** Klug

TURKEY, N.W., S.W., N., C., N.E. and E.: Istanbul (3); Aydin (1); Samsun (10); Amasya (5 and 7); Trabzon (9 and 14); Gumusane (13); Erzurum (10). 11 ♂, 3 ♀.

EUROPE and MEDITERRANEAN to S.W. IRAN, Mountains of C. ASIA to UZBEK, KIRGHIZ and the AMUR region of E. ASIA; replaced by ssp. *yanoi* in Japan.

### *†***Athalia cornubiae*** Benson

TURKEY, N. and N.E.: Bolu (1); Trabzon (7 and 15). Sea level to 2,000 m. 3 ♀. EUROPE and MEDITERRANEAN to IRAN.

### †***Athalia paradoxa*** Konow

TURKEY, W. and E.: Bursa (3); Gumusane (3); Erzurum (3). 3 ♀.

Mountains of C. EUROPE (France, Switzerland and Austria), MACEDONIA and TURKEY.

## EMPRIINI

### * ***Harpiphorus lepidus*** (Klug)

TURKEY, E.: Erzurum (5). 1 ♀, in *Quercus* scrub.

Not previously recorded outside EUROPE.

### ***Monostegia abdominalis*** (F.)

TURKEY, N., C. and N.E.: Samsun (10, 11 and 21); Ankara (11 and 33); Amasya (1 and 7); Tokat (1); Trabzon (4). 20 ♀.

EUROPE to SPAIN and CAUCASUS, ISRAEL, TURKEY, TRANSCAUCASIA, SIBERIA and Atlantic coast of N. AMERICA.

### ****Monsoma pulverata*** (Retzius)

TURKEY, N.E.: Trabzon (4). 1 ♀; Rize (5). 1 ♂; Rize (2). 1 ♀.
Not recorded previously outside EUROPE.

### ***Empria archangelskii*** Dovnar-Zapolskiĭ

CYPRUS, TURKEY and TRANSCAUCASIA.

### ***Empria pravei*** Dovnar-Zapolskiĭ

N. IRAN: Mazandaran, Chalus-Shahasavar coast of Caspian, 1 ♀, 10.iv.1967 (*D. B. Baker*).

N. CAUCASUS, TRANSCAUCASIA and N. IRAN.

### †***Empria klugii*** Stephens

TURKEY, N.E.: Trabzon (17); Rize (2). 3 ♀.

EUROPE, TURKEY and TRANSCAUCASIA.

### †***Empria excisa*** Thomson

TURKEY, N.: Samsun (2). 1 ♂.

EUROPE and TURKEY.

### ***Empria baltica*** Conde

EUROPE and TRANSCAUCASIA.

### ***Empria liturata*** (Gmelin)

TURKEY, N.E.: Rize (2). 1 ♂.
EUROPE, TURKEY and SIBERIA to Irkutsk.

### ***Empria tridens*** (Konow)

TURKEY, N.E.: Giresun (1); Trabzon (3). 2 ♀.

EUROPE and TURKEY.

### ***Empria konowi*** Dovnar-Zapolskiĭ

UKRAINE and TRANSCAUCASIA.

### ***Ametastegia equiseti*** (Fallén)

Turkey, S., N., C., N.E. and E.: Mersin (7); Samsun (21); Amasya (9); Trabzon (3); Rize (1 and 6); Erzurum (7). 7 ♂, 4 ♀.

Europe, Mediterranean, Turkey, Siberia to N. America.

### ***Protemphytus pallipes*** (Spinola)

Turkey, N. and N.E.: Samsun (6); Trabzon (7). 3 ♀.

Europe to Iceland, Mediterranean, Turkey to Iran, Siberia, N. America.

### ***Protemphytus carpini*** (Hartig)

Europe, Mediterranean, Turkey, Transcaucasia and Siberia.

### ***Protemphytes tener*** (Fallén)

Europe, Mediterranean, Turkey, Transcaucasia, Siberia to N. America.

## ALLANTINI

### ***Taxonus agrorum*** (Fallén)

Turkey, N.E.: Artvin, above Artvin, 700 m., 1 ♂, 1 ♀, 2.vi.1962 (*Guichard & Harvey*). Not previously recorded outside Europe.

### ***Taxonus sticticus*** (Klug)

C. and S.E. Europe and Transcaucasia.

### ***Allantus togatus*** Panzer

Turkey, E.: Erzurum (10). 1 ♂.

Europe, Turkey, Siberia to Japan.

### ***Allantus viennensis*** (Schrank)

C. and S. Europe and Transcaucasia.

### ***Allantus calceatus*** (Klug)

Europe and Transcaucasia.

### ***Allantus basalis*** (Klug)

Turkey, W. and N.: Bursa (9); Samsun (6). 1 ♂, 2 ♀.

N. and C. Europe, Turkey and Siberia.

### ***Allantus cinctus*** (L.)

Turkey, C. and N.E.: Amasya (7 and 13); Gumusane (11). 1 ♂, 2 ♀.

Europe, Turkey, Transcaucasia, Siberia to N. America.

### ***Allantus cingulatus*** (Scopoli)

Europe, Transcaucasia and Siberia.

### ***Allantus didymus*** (Klug)

Turkey, S., N., C. and E.: Mersin (6); Nigde (5); Bolu (2); Ankara (29); Amasya (2, 3, 5, 6 and 7); Tokat (1); Gumusane (10); Erzurum (4 and 6). 19 ♂, 12 ♀. N. Iran: Mesanderan, Chalus-Shahsavar coast of Caspian Sea, alt. 20 m., 1 ♀, 19.iv.1966 (*D. B. Baker*).

Mediterranean, Turkey and Iran.

### ****Allantus melanarius*** (Klug)

N. Iran: Mesandaran, Chalus-Shahsavar coast of Caspian Sea, alt. 20 m., 2 ♀, 19.v.1966 (*D. B. Baker*).

All Europe and Iran.

## CALIROINI

### ***Endelomyia aethiops*** (F.)

Turkey, N.: Samsun (2 and 25); 2 ♀.

Europe, Turkey, Transcaucasia and introduced into N. America.

### ***Caliroa cerasi*** (L.)

Turkey, N.: Samsun, Engiz, 9 ♂, v.1959 (*Guichard*).

Holarctic. Obligatorily parthenogenetic races of this species have been introduced with rosaceous fruit-trees, from its native country, presumably in Eurasia, to N. America and almost all other temperate regions of the world. The occurrence of males in Turkey may be significant in indicating the native country of this species, on the theory that introduced parthenogenetic races are descended from normally sexual races, native to some part of the world.

### ****Caliroa varipes*** (Klug)

Turkey, N.W., S., N. and C.: Istanbul (1, 3 and 8); Tekirdag (2); Mersin (6); Kastamonu (1); Samsun (1, 6, 7 and 13); Amasya (13). 12 ♂, 11 ♀.

All Europe and Turkey.

### ***Caliroa annulipes*** (Klug)

TURKEY, N.E.: Trabzon (15 and 16). 5 ♂, 3 ♀.

EUROPE, TURKEY and temperate ASIA to E. SIBERIA.

## HETERARTHRINI

### ****Heterarthrus vagans*** (Fallén)

TURKEY, N.E.: Rize, at sea level, 2 ♀, 12.iv.1959 (*Guichard*).

All EUROPE and TURKEY.

## FENUSINI

### ***Metallus beckeri*** (Konow)

Very close to European *M. pumilus* Klug, but the hind legs are almost entirely pale (*pumilus* has hind femur mainly infuscate from base) and the individual marginal saw teeth have more-rounded projections. In the saw therefore it resembles the nearctic *M. rohweri* MacGillivray; *M. albipes* Cameron and *M. gei* Brischke have saws resembling *M. pumilus*. The ♂ antenna is flattened as in *pumilus*.

TURKEY, N. and N.E.: Samsun (9). 1 ♂, 2 ♀; Trabzon, at sea level, 1 ♀, 24.viii.1959 (*Guichard*); Rize (5); 1 ♀.

Only known from TURKEY.

### ***Profenusa thomsoni*** (Konow)

EUROPE, TRANSCAUCASIA and N. AMERICA (? introduced).

### ***Profenusa pygmaea*** (Klug)

TURKEY, W. and C.: Bilecik (1); Amasya (13). 1 ♂, 1 ♀.

EUROPE and TURKEY.

### ***Hinatara recta*** (C. G. Thomson)

EUROPE and TRANSCAUCASIA.

### ***Scolioneura hyrcana* sp. n.**

♂. Black except for the following, which are brownish to yellowish white: labrum, palps, antennal segments 9 and underside of 5 to 8, tarsi, tibiae and apical one-third to one-half of femora. Wings hyaline; stigma, and venation black to piceous. Length 4·5 mm.

*Head* with mouthparts normal, antenna about × 1·5 breadth of head; 4th segment = 8th + 9th = 1st × 0·8. Eyes much enlarged and strongly converging in front where the distance between them is much less than the longest measure of the eye (1·0 : 1·5). Malar space linear.

*Thorax* with tarsal pulvilli of legs developed only on two apical tarsomeres. Claws bent medially at right angles and with sharp basal tooth.

*Wings* normal.

*Abdomen* without any visible sculpture.

*Pubescence* dense on upper head and mesopleura; on mesopleura up to about as long as diameter of an ocellus but on head shorter than this. On mesonotum and abdomen sparse.

Holotype ♂. N. IRAN: Mazandaran, Shalus–Shahsavar coast, 18.iv.1966 (*D. B. Baker*). B.M. (N.H.).

This species is distinguished at once from *S. betuleti* Klug and *S. tirolensis* Enslin by its strongly converging eyes, which are much closer together in front than their greatest length (in *S. betuleti* and *tirolensis* they are further apart than their greatest length, as 1·2 : 1·0) and also by the loss of the tarsal pulvilli on the two basal tarsomeres of the legs.

### ***Messa hortulana*** (Klug)

EUROPE and TRANSCAUCASIA.

### ***Fenusa dohrni*** (Tischbein)

TURKEY, E.: Rize (1). 1 ♀.

EUROPE, temperate ASIA and N. AMERICA; introduced to S. AFRICA.

### ***Kaliofenusa ulmi laevinota* ssp. n.**

Differs from the typical north holarctic race in that the coriaceous surface sculpture on the front and lateral mesonotal lobes is absent and the lobes are entirely smooth. The frontal basin is much shallower and the furrow separating the frontal area from the inner orbits is more clearly defined.

Holotype ♀. TURKEY: Mugla, Ula (Mezarlik) 700 m., on *Ulmus*, 17.iv.1962 (*Guichard & Harvey*). B.M. (N.H.).

Paratypes. TURKEY: Mugla, Ula (Mezarlik) 700 m.; on *Ulmus*, 1 ♀ and 8 ♂, 17.iv.1962 (*Guichard & Harvey*); Bursa, Bursa-Mudanya Rd., 50 m., 1 ♀, 28.iv.1962 (*Guichard & Harvey*); Corum, Iskilip, 700 m., 1 ♀, 9.v.1962 (*Guichard & Harvey*).

Species holarctic in distribution.

## LYCAOTINI

This tribe was revised by Benson, 1966.

### *†***Seljukia tenebrosa*** Benson, 1966

TURKEY, S.: Mersin, Gözne 600 m., 6 ♂, 11 ♀, 3–5.vi.1960 (*Guichard & Harvey*).

The representatives of this species were taken in a rocky broken terrain with alder-lined streams, 34 kms north of Mersin.

## PHYMATOCERINI

### ***Phymatocera aterrima*** (Klug)

C. and S. EUROPE and TRANSCAUCASIA.

## TOMOSTETHINI

### ***Tomostethus nigritus claripennis*** Enslin

N. Africa and Turkey.

Typical subspecies throughout Europe and across Siberia.

### ***Eutomostethus gagathinus*** (Klug)

*E. gagathinus meridionalis* Benson, 1954, **syn. n.**

Turkey, E.: Erzurum (13). 1 ♀.

All Europe, N. Africa, Cyprus, Turkey, Transcaucasia and Siberia.

### ***Eutomostethus luteiventris*** (Klug)

All Europe, Transcaucasia and N. America.

### ***Eutomostethus ephippium vopiscus*** (Konow)

Turkey, E.: Rize (1) 4 ♂; (2) 1 ♂; (5) 17 ♂, 5 ♀.

This subspecies differs from the typical one in that males predominate and that whereas the ♂ has an entirely black body (as in one of the two ♀ phases of the typical subspecies) the ♀ is more extensively red than in the red phase of the typical subspecies: it has the whole thorax red (in the red phase of the typical subspecies the mesoscutellum, with its post-tergite and the mesosternum are black). The legs of ♀ *vopiscus* differ from those of both ♀ forms of the typical subspecies in having the apical third of the femora, all the tibiae except the extreme apex as well as the basal tarsal segment and ± the apical one yellowish white; in the males the pale colour is brownish.

The typical subspecies is now found throughout Europe and N. America (? introduced) and there is a black-bodied form in the Himalayas: ssp. *vopiscus* is recorded only from Turkey and Transcaucasia.

### ***Stethomostus fuliginosis*** (Schrank)

Turkey, C. and N.E.: Bolu (3); Ankara (4); and Rize (1). 4 ♂, 1 ♀.

Europe, Turkey, Siberia, to Japan and N. America.

### ***Stethomostus funereus*** (Klug)

Turkey, N.E.: Rize (1). 3 ♂.

Europe, Turkey and Siberia.

## BLENNOCAMPINI

### ***Monophadnus spinolae*** (Klug)

Turkey, N.W.: Edirne (1). 1 ♀.

Europe and Turkey.

### ***Monophadnus fulviventris athalioides*** Jakovlev **stat. n.**

The only known difference between *M. athalioides* ♀ and *fulviventris* Scop. ♀ is in the colour of the thorax; the underthorax is all black in *fulviventris*, and in *athalioides* with the upper mesopleuron red. The mesonotum, apart from the postergite of the scutellum, is all red in *fulviventris* but is ± black-flecked in *athalioides*. They are probably best treated as geographical subspecies. *M. f. fulviventris* is restricted to C. and S. EUROPE and *M. f. athalioides* to TRANSCAUCASIA and CHINA.

### ***Monophadnus longicornis*** Hartig

TURKEY, N.: Samsun (12, 14 and 15). 5 ♂, 5 ♀.

EUROPE and TURKEY.

### ***Monophadnus pallescens*** (Gmelin)

TURKEY, N.E.: Trabzon (4 and 17); Rize (2 and 5). 11 ♀.

Temperate EURASIA and N. AMERICA.

## ***PERICLISTA*** Konow

*Apericlista* Enslin
*Cornaria* Malaise 1964, **syn. n.**

KEY TO EUROPEAN MALES AND FEMALES

1 Abdomen mainly pale beneath. Hind wing with anal cell sessile or subsessile (peduncle not more than one-half as long as width of anal cell). Clypeus medially emarginate. Ovipositor not longer than hind tibia . . . 2

– *Either* abdomen mainly dark beneath *or* anal cell in hind wing with peduncle longer than one-half width of anal cell, *or* clypeus subtruncate, *or* ovipositor longer than hind tibia . . . . . . . . . . . . . 4

2 (1) ♂ with abdomen mainly yellowish above and hind wing with marginal vein; ♀ with head black above and hind wing often with enclosed middle cell . 3

– ♂ with body entirely black above except for white tegula and apical margins of tergites, and hind wing without marginal vein; ♀ with head mainly reddish yellow above and without enclosed middle cell in hind wing. MEDITERRANEAN (MOROCCO, and PORTUGAL to BALKANS) . . . . ***andrei*** (Konow)

3 (2) Antenna about as long as head + thorax; ♀ with mesonotum mainly red. C. EUROPE to SPAIN and CAUCASUS . . . . . . ***albida*** (Klug)

– Antenna longer than head + thorax; ♀ mesonotum all black. (♂ not seen). C. EUROPE . . . . . . . . . . . . ***albiventris*** (Klug)

4 (1) Anal cell of hind wing with peduncle longer than one-half of width of cell. Hind wing with or without enclosed middle cell in ♀ or marginal vein in ♂. Ovipositor longer than hind tibia . . . . . . . . . . 5

– Anal cell of hind wing subsessile (peduncle less than one-half of width of cell). Hind wing with enclosed middle cell in ♀ and marginal vein in ♂. Ovipositor shorter than hind tibia. Legs with femora black. SPAIN and PORTUGAL ***dusmeti*** (Konow)

5 (4) Clypeus emarginate medially. ♀ hind wing with enclosed middle cell, and ♂ with marginal vein. Malar space at least two-thirds as long as diameter of ocellus in ♂ and ♀ . . . . . . . . . . . . . 6

– Clypeus evenly truncate. ♀ hind wing without enclosed middle cell and ♂ without marginal vein. Malar space less than one-half of diameter of ocellus in ♀ and linear in ♂. Body entirely black except for white-margined pronotum and abdominal segments. C. EUROPE . . ***albipennis*** (Zaddach)

6 (5) Head and thorax with only normal pubescence on middle of mesonotum, not longer than diameter of ocellus . . . . . . . . . . 7

– Head and thorax clothed in woolly pubescence on mesonotum up to × 2 diameter of ocellus. Abdomen black with pale apical margins to segments and, in ♀, with orange lateral band on down-turned lateral portions of tergites. Legs in ♂ yellowish with black coxae and bases of femora, but in ♀ femora mainly yellow with only extreme bases infuscate. C. EUROPE ***pubescens*** (Zaddach)

7 (6) Legs in both ♂ and ♀ mainly yellow except only for coxae and extreme bases of femora. Abdomen in ♂ infuscate below but ± yellow above; ♀ mainly black with pale apical margins to segments. AUSTRIA and TURKEY ***lenta*** Konow

– Legs in both ♂ and ♀ with mainly black femora and ± pale tibiae. Abdomen in both ♂ and ♀ mainly black with pale apical margins to segments. C. EUROPE . . . . . . . . . . ***lineolata*** (Klug)

### ***Periclista lenta*** Konow

TURKEY: Mugla, Kestep, 50 m., 3 ♂, 12.iv.1962 (*Guichard & Harvey*).

TURKEY [type locality Brussa].

### ***Monardis plana*** (Klug)

EUROPE and TRANSCAUCASIA.

### ***Ardis brunniventris*** (Hartig)

EUROPE, TURKEY, SIBERIA to JAPAN and N. AMERICA.

### ***Cladardis elongatula*** (Klug)

EUROPE and TURKEY.

### ***Claremontia tenuicornis*** (Klug) Ross, 1951

*Blennocampa tenuicornis* (Klug) Konow.
*Pseudoblennocampa tenuicornis* (Klug) Malaise, 1935.
*Monophadnoides tenuicornis* (Klug) Benson, 1952.

It seems to me reasonable to separate *Claremontia* Rohwer, 1909, in which the hind-orbits have a deep coriaceous groove and the hind wing has no enclosed middle cells, from *Monophadnoides*, in which the deep coriaceous hind-orbital groove is absent and the hind wings have normally an enclosed middle cell *M*. To *Claremontia* also belong *alternipes* Klug, **comb. n.** *puncticeps* Konow, **comb. n.** *confusa* Konow, **comb. n.** and the following species.

EUROPE, TURKEY and SIBERIA.

### *Claremontia waldheimii* (Gimmerthal) **comb. n.**

EUROPE and SIBERIA.

### **Monophadnoides ruficruris* (Brullé)

TURKEY, N.E.: Rize (5). 1 ♂.

Males of this species in Britain have some of the middle tergites ± marked with yellow. The ♂ from Turkey has tergites 3–5 and ± 2 and 6, and sternites 2–6 yellow. This may indicate a distinct race but more specimens would be needed to demonstrate this.

Not previously recorded outside EUROPE.

### *Halidamia affinis* (Fallén)

TURKEY: Amasya (5). 1 ♀.

EUROPE, TURKEY, TRANSCAUCASIA and N. AMERICA.

### *Pareophora pumilio* Konow

N. IRAN: Mazandaran, Chalus-Shahasavar coast of Caspian, 1 ♀, 28.iii.1966 (*D. B. Baker*).

S. and S.W. CASPIAN coast. [Type locality AZERBAYDZHAN, S.S.R., Lenkoran].

## TENTHREDINIDINAE

## ERIOCAMPINI

### **Eriocampa ovata ovata* (L.)

TURKEY, E.: Tokat (1). 3 ♀.

EUROPE, not previously recorded from TURKEY, introduced into N. AMERICA.

### **Eriocampa ovata nitens* **ssp. n.**

A series of this species from E. TURKEY lacks the transverse sculpture on the abdomen.

Holotype ♀. TURKEY: Rize, Cayeli, 15 m., 22.viii.1959 (*Guichard*). B.M. (N.H.).

Paratypes. TURKEY: Rize, Cayeli, 15 m., 19 ♀, 22.viii.1959 (*Guichard*); Rize, Rize, 15 m., 1 ♀, 21.viii.1959; Trabzon, Trabzon, at sea level, 1 ♀, 24.viii.1959 (*Guichard*). B.M. (N.H.).

The absence of transverse sculpture on the abdomen occurs as a rare aberration in the typical race of this species (e.g. SWEDEN: Skåne, Kivik, 1 ♀, 15.vii.1938 (*D. M. S. & J. F. Perkins*)), and is also characteristic of certain other species in the genus such as *E. dorpatica* Konow (E. EUROPE) and *E. peineae* Zirngiebl (IRAN)—it is possible that the latter is another form of *E. ovata*.

### ***Eriocampa peineae*** Zirngiebl, 1956

IRAN.

### ****Eriocampa umbratica*** (Klug)

TURKEY, N.E.: Trabzon (3, 4 and 16); Rize (2, 3 and 5); Artvin (4). 38 ♂, 51 ♀, Not previously recorded from outside EUROPE.

## PERINEURINI

### ***Aglaostigma langei*** (Konow)

C. EUROPE and TRANSCAUCASIA.

### ****Aglaostigma aucupariae lacteore*** **ssp. n.**

♂ differs from typical race in that the inter-antennal area and the whole face below the antennal sockets (except for the anterior tentorial pits) are yellowish white and this colour is continued along the edge of the inner orbits. (In the typical race most of the clypeus, the inter-antennal area, and the face below the antenna are black.)

The ♀ is scarcely distinguishable from that of the typical race except that the costa of the fore wing is paler apically.

Holotype ♂. TURKEY: Trabzon, Zigana Gecidi, 1,650 m., 22.v.1962 (*Guichard & Harvey*). B.M. (N.H.).

Paratypes. TURKEY: Bursa, Uludag, 500 m., 1 ♂, 1 ♀, 26.iv.1962 (*Guichard & Harvey*); Samsun, Samsun, 1 ♀, 20.vii.1959 (*Guichard*); Trabzon, Zigana Gecidi, 1,650 m., 1 ♂, 22.v.1962; Artvin, above Artvin, 1,800 m., 1 ♀, 6.vi.1962 (*Guichard & Harvey*). B.M. (N.H.).

Typical race throughout EUROPE to E. SIBERIA.

### ***TENTHREDOPSIS*** A. Costa

KEY TO SPECIES-GROUPS OF THE WORLD

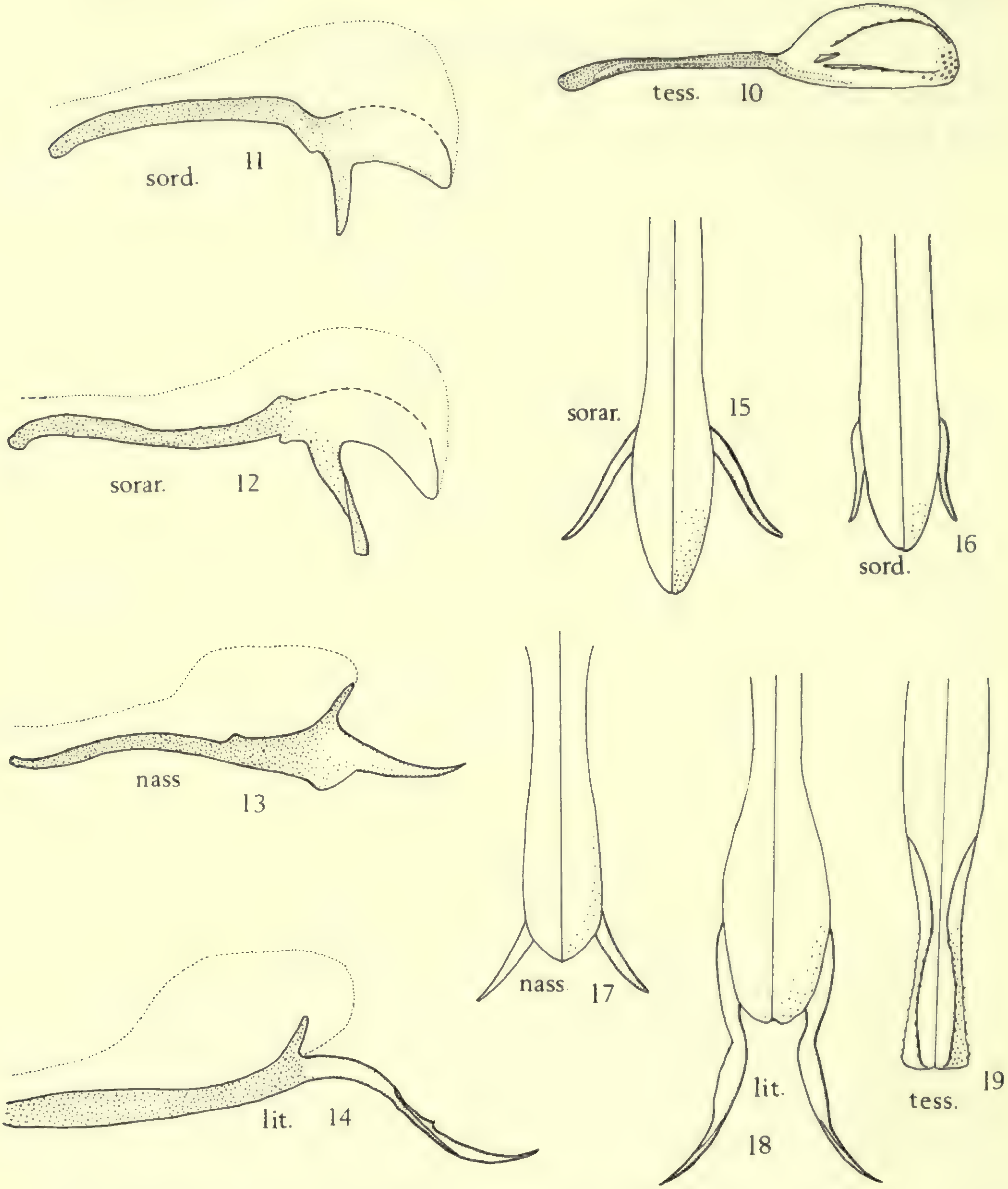
1 Clypeus subtruncate in front . . . . . . . . . . . 2

– Clypeus acutely or semicircularly excised in front medially to a depth of more than one-fourth of its maximal length. Penis valve without a spine. (Text-figs. 10 and 19). EUROPE and E. MEDITERRANEAN . . ***stigma*-group** (p. 157)

2 (1) Postocellar region slightly convex medially where it is about level with upper edge of the occipital carina and the temples. Antennal crests much smaller than 1st antennal segment, and joined behind to the edge of the frontal area without any deep excision . . . . . . . . . . 3

– Postocellar region excavated so that medially it is much below the level of the sharp edge of the occipital carina and the temples. Antennal crests often larger than 1st antennal segment and separated from edge of frontal area by a deep excision. Penis valve as in *stigma*-group. N. EURASIA ***auriculata*-group** (p. 157)

3 (2) Antenna not white-ringed, *nor* abdomen with 1st tergite black and flecked with opaque white, *nor* mesopleuron dull with dense sculpture . . . 5


tess. 10
sord. 11
sorar. 12
nass 13
lit. 14
sorar. 15
sord. 16
nass 17
lit. 18
tess. 19

FIGS. 10–19. 10–14. *Tenthredopsis* penis-valves in lateral view: 10, *tesselata*; 11, *sordida*; 12, *soraria*; 13, *nassata*; and 14, *litterata*. 15–19. *Tenthredopsis* penis-valves in dorsal view: 15, *soraria*; 16, *sordida*; 17, *nassata*; 18, *litterata*; and 19, *tesselata*.

– *Either* antenna white-ringed, *or* abdomen with 1st tergite black and flecked with opaque white, *or* mesopleuron dull with dense sculpture . . . . 4

4 (3) Antenna longer than costa and stigma of fore wing. Clypeus not entirely black. Abdomen never with flecks of opaque white, but in ♀ usually with a pair of ventral lateral black stripes. Penis valve as in *stigma*-group. C. EUROPE and C. to E. ASIA . . . . . . . ***tarsata*-group** (p. 159)

– Antenna not as long as costa + stigma of fore wing. Clypeus often entirely black. Abdomen sometimes with flecks of opaque white. Penis valve as in *stigma*-group. S.E. EUROPE and E. MEDITERRANEAN. ***albonotata*-group** (p. 159)

5 (3) ♂ with apical tergite carinate medially between two glabrous depressions; penis valve with spine (Text-figs. 11–18). ♀ *either* has hypopygium with the posterior medial projection enlarged and strongly excised apically (Text-figs. 21–23), *or* has malar space ± equal to inter-antennal line (1 : 1 to 1·2) and c. × 1·5 diameter of front ocellus. Occipital carina well developed and continuous. ♀ abdomen variously coloured but not with a pair of black ventral lateral stripes on a paler background except sometimes in *sordida*. PALAEARCTIC . . . . . . . . ***nassata*-group** (p. 161)

– ♂ with apical tergite not modified thus; penis valve as in *stigma*-group, without a spine. ♀ with medial posterior projection of hypopygium not enlarged nor excised apically. Malar space much shorter than inter-antennal line (1 : 1·3 to 1·5) and at most as long as front ocellus, *or* occipital carina obsolescent laterally behind the orbits. ♀ abdomen usually with a pair of black ventral lateral stripes. E. MEDITERRANEAN . . ***festiva*-group** (p. 160)

### KEY TO *AURICULATA*-GROUP MALES AND FEMALES

1 Antenna longer than costa + stigma of fore wing. ♀ black with following parts white: labrum, clypeus, face, antennal crests, orbits, ± temples, pronotum, tegula, scutellum, flecks on mesonotal lobes and pleura, broad ventral and lateral strips on abdomen which dorsally is brown, medially, legs; legs brown to piceous with coxae, trochanters and tarsi ± white; ♂ differs in that the underside of the thorax is ± entirely white, and the head is almost entirely white except for frontal area. 9–10 mm.

The Japanese race, ssp. *japonica* Takeuchi, is often larger (10–12 mm.) and the black is more extensive: the ♀ is entirely black except for the white labrum, clypeus, lateral and ventral stripe of the abdomen, and the legs are black except for the yellowish white trochanters, front and middle tibiae, and tarsi. N. PALAEARCTIC (N. EUROPE to E. SIBERIA and JAPAN) ***carinata*** Malaise

– Antenna shorter than costa ± stigma of fore wing. ♀ mostly yellowish brown with white markings; ♂ mostly black above and ± white below. 9–10 mm. N. PALAEARCTIC (N. EUROPE to E. SIBERIA) . . †***auriculata*** C. G. Thomson[1]

### KEY TO *STIGMA*-GROUP MALES AND FEMALES

1 Mesopleura with mesepisterum shining, scarcely punctured . . . . 2

– Mesopleura dull with dense surface sculpture on mesepisterum between the punctures. Black with 4 middle abdominal segments red: white on clypeus, each side of labrum, inner orbits, temples, pronotum, tegula, scutellum and metanotum. Wings sybhyaline; venation black except for base of stigma, *C* and *Sc* of fore wing, which are white. 9–11 mm. S. and S. E. Europe **floricola** Costa

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[1] The following are synonyms of *T. auriculata*: *Tenthredo sachalinensis* Matsumura, 1911, **syn. n.** *Tenthredopsis camtschatcali* Enslin, 1927, **syn. n.**

2 (1) Head with occipital carina well developed from gena to vertex . . . 3

– Head with occipital carina obsolescent laterally behind eyes.

Head and thorax black with white on labrum, inner orbits, temples, pronotum, tegula, scutellum; abdomen fulvous except for 1st tergite and sawsheath. Wings subhyaline and venation black except for base of stigma, *C* and *Sc* of fore wing. 9–11 mm. Turkey . . . . . . **guichardi** sp. n.

3 (2) Claws sub-bifid. Anal cell of fore wing normal . . . . . . . 4

– Inner tooth of claws smaller than end tooth and very short on front and middle legs. Anal cell of fore wing with cross-vein missing (? abnormal specimen). Black species with the following parts white: labrum, sides of clypeus, inner orbits, temples, edge of pronotum, tegulae, femora (except for inner stripe) and tibiae (except for inner stripe of hind pair) and yellowish white lateral stripe from 2nd to 7th tergites of abdomen. 8 mm. Turkey. ♀ only **harveyi** sp. n.

4 (3) Antenna shorter than costa of fore wing in ♀ and about as long as costa in ♂. With 8th segment × 2–2·5 times as long as broad. ♀ wings slightly flavescent with venation yellowish white to brown. Black with the following parts yellow: labrum, sides of clypeus, fleck on inner orbits, fleck on temple, underside of antenna, edge of pronotum, tegula, scutellum, tergites 3–6 of abdomen (except for mid-dorsal stripe) and most of legs. ♂ as ♀ except that the middle segments of the abdomen are buff with a black mid-dorsal band and a ventral lateral band each side. 9–11 mm. C. and N. Europe **stigma** (Fallén)

– Antenna as long as costa in ♀ and costa + stigma in ♂, with 8th segment × 2·5–3 times as long as broad. Wings subhyaline or slightly infuscate, with venation mainly black or brown. 6·5–11 mm.

This complex of colour-forms more or less segregated into local races but with every intergradation have heretofore been treated as divisible into numerous species. Basically the ♀ colour pattern is black with the following parts white: labrum, ± clypeus, fleck on inner orbits and temples, underside of antenna, edge of pronotum, tegula and middle of scutellum. Abdominal segments 3–6 are reddish yellow apart from a ± developed mid-dorsal line and a longitudinal lateral ventral stripe each side. The femora, tibiae and tarsi are also mainly reddish yellow.

In the paler forms the extent of white increases and the head can be almost entirely white apart from the frontal area, the posterior orbits, the postgenae and occiput; on the thorax the pronotum can become entirely white and white flecks can develop on the mesonotal lobes and mesopleura; on the abdomen yellowish white and then white flecks appear first on the sides of the first tergite and then yellow progressively entirely replaces the reddish yellow colour of the abdomen (f. *albata* Konow, Caucasus). In some forms the basic reddish brown is replaced by white and the black mid-dorsal line extends along the apical margins of the tergite (f. *hungarica* Klug and *lactiflua* Klug, C. and S.E. Europe). In f. *corcyrensis* André S. and S.E. Europe, the basic pattern is altered by the labrum, clypeus, scutellum and ± legs becoming entirely black, with, at the same time, the disappearance of the mid-dorsal and lateral ventral abdominal lines. The basic ♂ pattern is as that described above for *stigma*. Europe and E. Mediterranean **tesselata** (Klug)[2]

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[2] Synonyms of *T. tessalata*: *Tenthredo hungarica* Klug, **syn. n.** *T. lactiflua* Klug, **syn. n.** *Perineura excisa* Thomson, **syn. n.** *Tenthredopsis corcyrensis* André, **syn. n.** *T. albata* Konow, **syn. n.**

### KEY TO *ALBONOTATA*-GROUP MALES AND FEMALES

1 Eyes only slightly converge in front where they are much further apart than the length of an eye. Malar space at least about as long as the diameter of front ocellus . . . . . . . . . . . . . . . 2

– Eyes so strongly converging in front that they are closer together here than the length of an eye. Malar space correspondingly short, about one-third as long as diameter of front ocellus.

Only ♂ is known and this is a mainly black species with white labrum, mandibles and reddish legs, and antenna white-ringed from 7th segment (8th and 9th segments missing in unique type). Head strongly narrowed behind the eyes and mesopleura dull with dense surface sculpture. 9·5 mm. ISRAEL . . . . . . . . . . **convergens** Benson

2 (1) Mesopleura dull with dense surface sculpture. Hind tarsus not white on apical segments. Abdomen with or without white flecks on 1st tergite . . . 3

– Mesopleura shining and sparsely punctured. Hind tarsus with 3rd to 5th segments ± white. Antenna with or without a white ring covering ± 6th and following segments.

Black with red banded abdomen and white labrum, scutellum and fleck each side of 1st tergite. 9–11 mm. S.E. EUROPE and E. MEDITERRANEAN **albopunctata** (Tischbein)[3]

3 (2) Antenna ringed with white or yellowish white on 6th and ± some of the following segments: Pronotum, tegula and 1st tergite entirely black. Otherwise black with red-banded abdomen and white labrum and scutellum. 9–11 mm. C., S. and S.E. EUROPE and E. MEDITERRANEAN . **annuligera** (Tischbein)[4]

– Antenna brown or black, ± pale below, but not ringed with white or yellowish white. Edge of pronotum and often tegula entirely white, and there is an opaque white fleck each side of the 1st tergite. Otherwise coloured as in the preceding species except that in the red band of the abdomen is ± suffused over or obsolete. 9–10 mm. S.E. EUROPE and E. MEDITERRANEAN ♂♀ **albonotata** (Brullé)

### KEY TO *TARSATA*-GROUP MALES AND FEMALES

1 Smaller (8–9 mm.) with head strongly contracted behind eyes in dorsal view. Mesopleura scarcely punctate but with fine surface sculpture. S.E. ASIA (BURMA and FORMOSA) . . . . . . . . . . . . . 2

– Larger (10–12 mm.) with head parallel-sided in dorsal view. Mesopleura dull with dense surface sculpture between coarse punctures. (Black with 4 middle abdominal segments red in ♀, and scutellum white-marked; ♂ with the middle abdominal segments ± infuscate as in scutellum.) C. and S.E. EUROPE ♂♀ **tarsata** (Konow)

2 (1) Lateral ridge to frontal area of head continuous with antennal crests. Antenna not white-ringed and scutellum not marked with white. Two colour phases described originally as subspecies: mainly brown and mainly black. BURMA-YUNNAN frontier . . . . . . . **birmanica** (Malaise)[5]

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[3] Synonyms of *T. albopunctata*: *Tenthredo benthini* Rudow, **syn. n.** *Tenthredo balcana* Mocsáry, **syn. n.** *Tenthredopsis casia* Konow, **syn. n.** *T. quadrannulata* Konow, **syn. n.** *T. triforis* Konow, **syn. n.**

[4] Synonyms of *T. annuligera*: *Tenthredo tischbeini* Frivaldskii, **syn. n.** **Tenthredopsis andrei* Konow, **syn. n.** **T. pisinna* Konow, **syn. n.**

[5] Synonym of *T. birmanica*: *Thomsonia birmanica nigrorufa* Malaise, **syn. n.**

– Lateral ridge to frontal area of head and antennal crests notched medially. Antenna often ± white-ringed from 6th and following segments, and scutellum usually white-marked. S.E. ASIA (BURMA and FORMOSA) **insularis** Takeuchi[6]

### KEY TO *FESTIVA*-GROUP MALES AND FEMALES

In the B.M. (N.H.) there is a ♀ unnamed N. American species of this group of *Tenthredopsis*. It was sent to the Museum by Norton in 1865 as a representative of his recently described *Allantus piceocinctus* but it is not even congeneric with the type of that species. It was collected at Farrington, Connecticut. The genus is not now recognized in N. America, though larvae are recorded by Maxwell, 1955 : 93.

1 Green species with black markings, and *either* occipital carina obsolescent laterally, *or* inner tooth of claw diverging from end tooth and slimmer than it 2

– Brown or red and black species. Occipital carina well-developed along whole hind margin of head, and inner tooth of claw parallel to end tooth and equal to it in girth . . . . . . . . . . . . . 3

2 (1) Occipital carina obsolescent behind eyes. Malar space (♀) × 2 diameter of front ocellus. Claws with inner tooth parallel to end tooth and equal to it in girth. Pulvillus on hind basitarsus only about half as long as apical breadth of basitarsus. Green with black fleck on frontal and postocellar regions of head, on each of the mesonotal lobes and in the middle of each tergite so as to form a medial abdominal row. Stigma entirely green. 8·5 mm. TRANSCAUCASIA . . . . . . . . . . **viridis** Zhelochovtsev

– Occipital carina well developed along whole hind margin of head. Malar space (♀) about × 1·5 diameter of front ocellus. Claws with inner tooth diverging from end tooth and slimmer (♀) or shorter (♂) than it. Pulvillus on hind basitarsus about as long as apical breadth of hind basitarsus. Green with black markings on head, mesonotum, mesosternum, middle dorsal line and two lateral ventral lines on abdomen. Stigma dark with green base. 9–10 mm. TRANSCAUCASIA . . . . . . . . . . **ornatrix** Konow

3 (1) Anal cell of fore wing with cross-vein suberect and nearer base than apex of cell. Claws sub-bifid. Abdomen banded yellow or red, and with a pair of ventral dark stripes . . . . . . . . . . . . . . 4

– Anal cell of fore wing with cross-vein oblique and near middle of cell. Claws with inner tooth shorter than end tooth. Black with white markings on head, thorax and margins of abdominal segments.

Unique ♀. 7 mm. (? abnormal dwarf) has asymmetric supernumerary cross-veins. TRANSCAUCASIA . . . . . . . . **nigrescens** Konow

4 (3) Head with clypeus, inner orbits, temporal spot and thorax with edge of pronotum and fleck on mesonotum white. Inner hind tibial spur about half as long as basitarsus . . . . . . . . . . . . . 5

– Head with clypeus black and thorax (apart from tegula and ± mesoscutellum) entirely black. Inner hind tibial spur only about two-fifths as long as basitarsus.

Abdomen with yellow band covering segments 3–9. Legs yellow with infuscate coxae and hind tarsus. ♂ not seen. 7·5 mm. TRANSCAUCASIA and TURKEY . . . . . . . . . . **nigella** Konow

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[6] Various colour forms of this species were originally described as sympatric subspecies on the Burma–Yunnan frontier and together with another from Formosa are synonyms of *insularis* Takeuchi: *Thomsonia insularis brunnescens* Malaise, **syn. n.** *T. insularis continentalis* Malaise, **syn. n.** *T. insularis deannulata* Malaise, **syn. n.** *T. insularis fuscicornis* Malaise, **syn. n.** *T. insularis ruficornis* Malaise, **syn. n.** (Formosa).

5 (4) Abdomen with segments 2–6 pale yellow. Hind coxae entirely black. ♂ not seen. 8–10 mm. Turkey . . . . . . . **straminata** Konow

– Abdomen with segments 2–8 reddish yellow. Hind coxae black with broad lateral and ventral yellowish white stripes. 10 mm. Transcaucasia **festiva** Konow

## Key to *NASSATA*-group

1 ♂♂ . . . . . . . . . . . . . . . . 2

– ♀♀ . . . . . . . . . . . . . . . . 5

2 (1) Spine on penis-valve shorter than inner hind tibial spur (Text-figs. 11–13 and 15–17). Hypopygium with at most a small emargination, not as wide as the length of this spur (Text-figs. 20, 22 and 23). Colour variable but antennae are always fuscous above and pale brown below . . . . 3

– Spine on penis-valve longer than inner hind tibial spur (Text-figs. 14 and 18). Hypopygium with a wide apical emargination about as wide as the length of this spur (Text-fig. 21). Head white below and on orbits, black above; antennae reddish yellow below and brown above; thorax yellowish white with black and yellow markings above; abdomen mainly reddish yellow marked with black on basal tergites. Large species 10–12 mm. Europe and Turkey . . . . . . . . . . ♂ **litterata** (Geoffroy)

3 (2) Penis-valve with spine attached before apex (Text-figs. 11, 12, 15 and 16) . . 4

– Penis-valve with spine at apex (Text-figs. 13 and 17).

♂ without external vein to hind wing is thought by some to represent the ♂ of another species known as *coquebertii* but their exact significance is unknown. 7–11 mm. Europe, Turkey and Siberia to Japan ♂ **nassata** (L.)

4 (3) Spines set close together on penis-valve and much shorter than apical breadth of hind tibia (Text-figs. 11 and 16). Straw-coloured species with black markings on head, thorax and abdomen. 8–10 mm. Europe ♂ **sordida** (Kl.)

– Spines set about half their own length apart on penis-valve and about as long as apical breadth of hind tibia (Text-figs. 12 and 15). Black species with yellowish white markings on face, orbits and thorax. 11 mm. Transcaucasia . . . . . . . . . . . ♂ **sororia** Konow

5 (1) Medial projection to hypopygium greatly enlarged so it is longer and broader at base than length of an inner middle tibial spur (Text-figs. 21 and 22) . 6

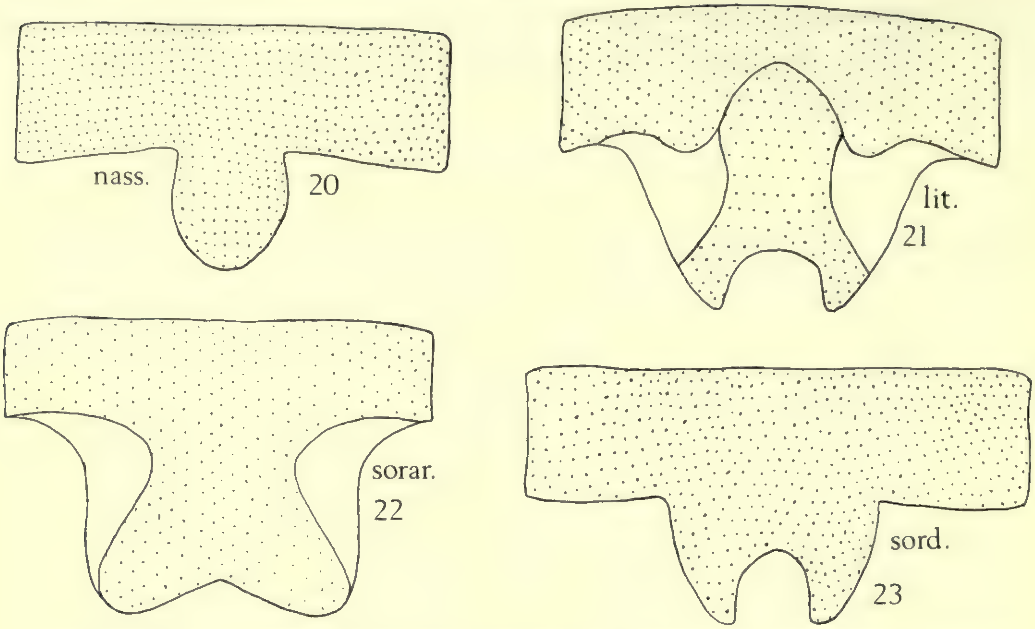
– Medial projection to hypopygium much shorter and narrower than length of inner middle tibial spur . . . . . . . . . . . 7

6 (5) Projection to hypopygium narrowed behind, where it is narrower than the length of an inner middle hind tibial spur, and at its apex it is sharply excised (Text-fig. 21). Malar space almost equal to inter-antennal line and diameter of front ocellus. Pulvillus on basitarsus about as long as basal breadth of basitarsus and almost as long as pulvillus on succeeding tarsomere. 11–13 mm. . . . . . . . . . . . . ♀ **litterata** (Geoffroy)

– Projection to hypopygium scarcely narrowed behind where it is as wide as the length of an inner middle hind tibial spur, and at its apex it is broadly and slightly emarginate (Text-fig. 22). Malar space only about two-thirds of inter-antennal line and equal to diameter of front ocellus. Pulvillus on hind basitarsus about two-thirds of basal breadth of basitarsus and two-thirds of length of pulvillus on succeeding tarsomere. 12 mm. . ♀ **sororia** Konow

7 (5) Straw-coloured species marked with brown and black. Projection to hypopygium deeply excised apically (Text-fig. 23). 9–11 mm. . ♀ **sordida** (Klug)

– Very variable in colour from yellowish white, to brown, or red and more or less marked with black and white, to almost entirely black. Projection to hypopygium at most emarginate at an extreme apex (Text-fig. 20). 9–12 mm. ♀ **nassata** (L.)



FIGS. 20–23. *Tenthredopsis* hypopygia: 20, *nassata*; 21, *litterata*; 22, *soraria*; and 23, *sordida*.

### [*Tenthredopsis floricola* A. Costa

TURKEY: Istanbul (2–3). 2 ♀.
S. and S.E. EUROPE].

### ****Tenthredopsis guichardi*** **sp. n.**

♀. Head and thorax black with the following parts creamy white: labrum, ± clypeus, inner orbits, fleck behind eyes on lateral hind margin of head above, underside of flagellum, hind margin of pronotum, tegula, scutellum and fleck in middle of its post-tergite, metascutellum, small fleck on front and middle coxae and large fleck on side of hind coxa. Legs yellow except for most of coxae, trochanters and extreme base of front and middle and most of hind femora, which are black. Wings subhyaline; stigma with basal half white and apical black; costa and subcosta yellow; rest of venation piceous except at extreme base of wing. Abdomen yellowish brown, except for the mainly black 1st, ± middle of 2nd and 9th tergites, and saw-sheath. Length: 10–11 mm.

*Head* shining, with obsolescent punctation. Clypeus medially emarginate in front to depth of nearly one-third of its total length. Malar space nearly as long as diameter of front ocellus. Antenna about × 2 as long as width of head behind the eyes. Frontal area with raised lateral margins fused with antennal crests and with a deep median groove from the front ocellus to the interantennal region. Carina on hind margin of head obsolete laterally behind the eyes so that genal carina below is separated from the occipital carina above. Distance between hind ocelli less than distance of an ocellus from occipital carina as 1·0 : 1·7, and less than distance of an ocellus to margin of eye as 1·0 : 1.9.

*Thorax* normal with underthorax and mesonotum, apart from front half of front lobes, almost impunctate except in the sunken lateral areas of the latter which are rugose and the scutellum which is opaque with a line of regular punctures separating the post-tergite which is ± alutaceous.

*Legs* normal; inner hind tibial spur about half as long as basitarsus.

*Wings* normal.

*Abdomen* with fine surface alutaceous sculpture above. Hypopygium and saw as in *T. stigma.*

*Pubescence* over head and thorax pale and shorter than diameter of ocellus.

♂ as in ♀ but thorax including tegular entirely black and white on inner orbits and temples is much reduced. Pubescence on head infuscate. Distance between hind ocelli less than distance between ocellus and occipital carina as 1·0 : 1·3, and as distance between ocellus and eye margin as 1·0 : 1·7. Hind wings with marginal vein. Genitalia much as in *T. stigma* Klug (Text-figs. 10 and 19).

Length: 9–10·5 mm.

Holotype ♀. TURKEY: Ankara, Kubuk, 830 m., 22.v.1960 (*Guichard & Harvey*). B.M. (N.H.).

Paratypes. Same locality, 3 ♂, 5 ♀, 21–22.v.1960 (*Guichard & Harvey*); TURKEY: Erzurum, 20 m. from Ispir on Ikizdere Road, 1,700 m., 1 ♀, 2.vi.1962 (*Guichard & Harvey*). B.M. (N.H.).

## ****Tenthredopsis harveyi* sp. n.**

♀. Black with the following parts white to yellowish white: palps, mandible bases, labrum, clypeus (except middle third), underside of antenna, spot on gena, inner orbits and spot behind temple, edge of pronotum, tegula, legs (except coxae, trochanters, spot on inner base of front femur, line on inner side of middle femur, and inner side of hind femur and tibia, most of hind tarsus), lateral each side of abdomen covering one-fourth of the width of tergites 2–7, a lateral fleck each side of middle of 1st tergite and ± narrow apical margins of succeeding tergites and sternites.

*Wings* hyaline with costa and subcosta and base of stigma white, rest of venation piceous. Length 8·5 mm.

*Head* shining, with obsolescent punctation. Clypeus medially emarginate in front to depth of nearly one-third of its total length. Malar space slightly longer than diameter of front ocellus. Antenna more than × 2 as long as width of head behind eyes. Frontal area slightly convex above but with a deep round concavity above the interantennal area. Occipital carina clearly defined throughout. Hind ocelli further apart than from occipital carina as 1·0 : 1·4 and from margin of eye as 1·0 : 1·9.

*Thorax* shining but with definite punctures dense on front of mesonotum, sparse on lateral lobes, scutellum, episternum and sternum of thorax, but the depressed lateral areas of the mesonotum as well as the mesepimeron and metapleura are dull and regulose. Legs normal with inner spur of hind tibia about half as long as basitarsus, but the inner tooth of the claw is not as long as the end tooth on the hind legs and on the front and middle legs is only about half as long as end tooth.

*Wings* with the cross-vein to the anal cell missing in the fore wings but this may be an individual abnormality.

*Abdomen* finely alutaceous above, hypopygium and saw normal (as in *T. stigma*).

*Pubescence* pale on head and thorax and up to as long as diameter of an ocellus.

Holotype ♀. TURKEY: Bolu, Ala Dagi, 2,000 m., Kartal Kaya Tepe, 15.vii.1962 (*Guichard & Harvey*). B.M. (N.H.).

### **Tenthredopsis tesselata** (Klug)

TURKEY, N.W., W., N. to E.: Widespread from Istanbul (3); Bursa (4); Samsun (5 and 6); Erzurum (6). Up to 1,700 m. 52 ♂, 59 ♀, iv–vi, in many colour forms including f. *albata*, Konow, f. *excisa* Thomson and f. *corcyrensis* André.

N. IRAN: Elburz Mts., 2,000 m. (*G. Heinrich*).

All EUROPE and TURKEY to N. IRAN.

### †**Tenthredopsis convergens** Benson, 1954

ISRAEL.

### **Tenthredopsis albopunctata** (Tischbein)

TURKEY, N.W., W., S.W., S., C., N.: Istanbul (2); Bursa (4 and 9); Mugla (10); Antalya (10); Samsun (24); Amasya (2, 5, 6, 7 and 13); Corum (2); up to 1,000 m. (near Merzifon in Amasya on 3.vi.59), 17.iv to 6.vi.1959–62 and 20.vii.59 (near sea level at Samsun ? 2nd brood). Forms with and without white-ringed antennae or tarsi occurred together. 20 ♂, 2 ♀.

S.E. EUROPE (Yugoslavia, Bulgaria, Greece and Turkey) and ASIA MINOR.

### **Tenthredopsis annuligera** (Tischbein)

TURKEY, C.: Amasya (1 and 6). 1 ♂, 6 ♀.

C., S. and S.E. EUROPE (France, Germany, Czechoslovakia, Yugoslavia, Corfu, Russia) and TURKEY.

### **Tenthredopsis albonata** (Brullé)

S.E. EUROPE (Greece and Turkey) and E. MEDITERRANEAN (Syria, Lebanon and Israel).

### **Tenthredopsis viridis** Zhelochovtsev, 1941

TRANSCAUCASIA.

### †**Tenthredopsis ornatrix** Konow

TRANSCAUCASIA.

### †**Tenthredopsis nigrescens** Konow

TURKEY (W.): Usak, Bulgaz Dag, Namrun, 1,400–1,600 m., 1 ♀, 9–16.vi.1965 (Gembloux Coll. Belgium), and TRANSCAUCASIA.

### †**Tenthredopsis nigella** Konow

TRANSCAUCASIA, TURKEY.

### †***Tenthredopsis straminata*** Konow

S. TURKEY (Taurus Mountains).

### †***Tenthredopsis festiva*** Konow

TRANSCAUCASIA.

### ***Tenthredopsis litterata*** (Geoffroy)

TURKEY, N.W., C. and E.: Istanbul (3); Amasya (3 and 7) and Erzurum (6). 4 ♂, 2 ♀.

All EUROPE and TURKEY.

### †***Tenthredopsis sororia*** Konow

TRANSCAUCASIA.

### ***Tenthredopsis nassata*** (L.)

TURKEY (C. and N.E.): Ankara (39); Cankiri, Isik Dag, 1,200 m., 1 ♀, 25.vi.1966 (Demelt Coll.); Amasya (3, 13); Trabzon (15).

EUROPE, ASIA MINOR, SIBERIA to JAPAN.

## TENTHREDINIDINI

### ***RHOGOGASTER*** Konow

*Rhogogaster* was revised by Benson, 1965.

### *†***Rhogogaster genistae*** Benson

TURKEY, C.: Amasya (7). 1 ♂, 2 ♀.

Also EUROPE, N. AFRICA.

### ***Rhogogaster picta*** (Klug)

TURKEY, N.W., W., C., N.E. and E.: Istanbul (3); Bilecik (1 and 2); Konya (3); Amasya (7 and 13); Giresun (3); Erzurum (4). 10 ♂, 14 ♀.

Also EUROPE and TURKEY.

### *†***Rhogogaster dryas*** (Benson)

TURKEY, C.: Amasya (5 and 18). 4 ♀.

EUROPE and TURKEY.

### **Rhogogaster punctulata** (Klug)

TURKEY, N.E.: Trabzon (4 and 15); Artvin (4). 1,246–1,800 m. 5 ♀.

These specimens seem to be racially distinct from the normal European form in the complete lack of the lateral row of black spots each side of the abdomen. This form has also occurred as a rare aberration in Finland.

EUROPE and TURKEY.

### *†**Rhogogaster naias** Benson, 1965

TURKEY, E.: Gumusane (5). 11 ♂, 12 ♀.

Type series.

### **Rhogogaster viridis** (L.)

TURKEY, C., N.E. and E.: Ankara (12); Amasya (13); Trabzon (3); Rize (8); Artvin (3); Erzurum (10). From sea level up to 2,600 m., 3 ♂, 7 ♀. Holarctic species.

### *†**Rhogogaster chlorosoma** (Benson)

TURKEY, N.W., C., N.E. and E.: Istanbul (9); Ankara (15, 35 and 41); Tokat (1); Konya (3); Giresun (3); Erzurum (6). From sea level up to 1,400 m., 1 ♂, 23 ♀.

EUROPE, TURKEY and SIBERIA.

### **Rhogogaster auctor** Weiffenbach, 1967

TURKEY: Nigde, Ciftehan, vi. 1965 and Ankara, Kizilkahaman, v. 1965 (Demelt Coll.).

## ***TENTHREDO*** L.

Keys to the palaearctic species of the *bifasciata-*, *zonula-*, *scrophulariae-* and *arcuata-*groups, (as well as the species now segregated as *Elinora* and *Cuneala*) were given by Enslin, 1910, and to the *olivacea-mesomelas-*, *cyanatra-atra-* and *maculata-temula-*groups by Enslin, 1920.

#### KEY TO SPECIES-GROUPS

1 Antennal crests, over antennal sockets, reach further forward (in dorsal view) than the level of the front of the eyes, and in the *olivacea-mesomelas* group, the crests are separated from the sides of the frontal area by a deep excision; the area between the crests is more than half as deep as the distance between them. Flagellum of antenna more than × 1½ the width of the head behind the eyes . . . . . . . . . . . . . . . . 2

– Antennal crests confluent with the sides of frontal area, and not reaching forward further than the level of the front of the eyes and/or the area between them is not half as deep as the width between them . . . . . 3

2 (1) Mostly green or green and black species but some partly yellow or brown, with antennal crests separated behind from the sides of the frontal area by a deep excision . . . . . . . ***olivacea-mesomelas*-group** (p. 167)

– Species variously coloured, often with black, red, brown or yellow but some with green, antennal crests behind confluent with sides of frontal area **cyanata-atra-group** (p. 167)

3 (1) Head strongly swollen behind eyes and, together with thorax, entirely black (except at most for small yellow flecks on edge of pronotum). Wings infuscate on at least apex of front pair (W. PALAEARCTIC) **bifasciata-group** (p. 169)

– Head not strongly swollen behind eyes, or head and thorax more richly marked with yellow. Wings ± hyaline or with infuscate patches . . . . 4

4 (3) Head with temples shining and at most sparsely punctured, and occipital carina obsolete behind post-ocellar region. Antenna less than twice as long as breadth of head behind eyes. Male hind tarsal claws without acute basal lobe . . . . . . . . . . **zonula-group** (p. 170)

– Head dull with strong punctation above or occipital carina well developed along whole of hind margin of head or including the post-ocellar region. Antenna long or short. Male hind tarsal claw with or without acute basal lobe . . . . . . . . . . . . . 5

5 (4) Wings hyaline in fresh specimens and antenna short (penultimate segment less than × 1½ as long as broad). Stigma mostly pale. Claws usually with a basal lobe ± developed. (HOLARCTIC) . . . **arcuata-group** (p. 176)

– Wings strongly flavescent, or infuscate, at least partly. Antenna often elongate (penultimate segment at least × 1½ as long as broad). Stigma often dark. Claws often without basal lobe . . . . . . . 6

6 (5) Fore wings evenly ± infuscate. Stigma black. Abdomen with metallic lustre. Mesosternum each side and mesoscutellum with tooth-like projection. Antenna often with penultimate segment less than × 1½ as long as broad. (ORIENTAL) . . . . . . . . . . **opposita-group**

– Fore wings subhyaline, flavescent or with infuscate patches. Stigma often pale. Abdomen not metallic. Mesosternum and often mesoscutellum without tooth-like projection. Antenna with penultimate segment at least × 1½ as long as broad . . . . . . . . . . . 7

7 (6) Wings flavescent, or fore wing with infuscate apex or front margin. Stigma pale. (HOLARCTIC) . . . **vespiformis-scrophulariae-group** (p. 175)

– Wings hyaline or stigma dark. (PALAEARCTIC) **maculata-temula-group** (p. 173) ***finschi*** and ***japonica***

## The *OLIVACEA-MESOMELAS*-group

### ***Tenthredo mesomelas*** L.

TURKEY, N., N.E. and E.: Bolu (1); Zonguldak (1); Trabzon (3, 4, 15 and 16); Gumusane (7 and 8). 700–2,600 m. 13 ♂, 28 ♀.

EUROPE, TURKEY, TRANSCAUCASIA and SIBERIA.

## The *CYANATA-ATRA*-group

### ***Tenthredo atra duplicata*** (Enslin)

This race differs from the typical race in always having white on the genae and each side of the 1st tergite.

TURKEY, E.: Trabzon (3). 2 ♂, 2 ♀; Trabzon (15). 5 ♀; Artvin (4). 1 ♀.

EUROPE and TRANSCAUCASIA.

The species occurs throughout EUROPE to E. SIBERIA.

### *Tenthredo mandibularis* F.

C. Europe and Transcaucasia.

### *Tenthredo araxana* Mocsáry

Transcaucasia.

### *Tenthredo caligator* Eversmann

Turkey, N.E.: Trabzon (15–16). 40 ♂, 59 ♀.

Turkey and Transcaucasia.

### *Tenthredo albopicta* Puls

Turkey, N.E.: Trabzon (15–16). 1 ♂.

Turkey and Transcaucasia.

### *Tenthredo discophora* Konow

Turkey, N., N.E. and E.: Bolu (1); Gumusane (7 and 11); Trabzon (14, 15, 16 and 17); Rize (8). 1,400 to 2,500 m. 22 ♂, 51 ♀, 27.v–14.vii.

Turkey and Transcaucasia.

### *Tenthredo purpurea* Puls

Turkey, N.E.: Trabzon (15–16). 3 ♂, 4 ♀.

Turkey and Transcaucasia.

### *Tenthredo livida* L.

Turkey, N.: Zonguldak (1). 1 ♀.

Europe, Turkey, Transcaucasia and Siberia.

### *Tenthredo colon* Klug

Turkey, W. and N.E.: Kutahya (9); Trabzon (14 and 15). 3 ♂, 3 ♀.

Europe, Turkey, Transcaucasia and N. Asia to Kamtchatka.

### *Tenthredo balteata* Klug

Turkey, N.E.: Trabzon (15); Rize (8). 2 ♀. Not previously recorded outside Europe.

### *Tenthredo solitaria* Scopoli

C. and S. Europe and Transcaucasia.

### ***Tenthredo ferruginea*** Schrank

TURKEY, N.E.: Trabzon (15); Rize (8). 1 ♂, 1 ♀.
EUROPE, TURKEY, TRANSCAUCASIA, SIBERIA to JAPAN.

### ***Tenthredo luteipennis*** Eversmann

TURKEY: Trabzon (13). 1 ♂; (14, 15). 17 ♂, 26 ♀.
TURKEY, and CAUCASUS and PAMIRS up to 3,400 m.

## The *BIFASCIATA*-group

This group consists of those species with ± infuscate wings, and head, greatly swollen behind the eyes, together with the thorax entirely black (except at most for small lateral yellow fleck on pronotum). Abdomen black with sometimes one or more tergites flecked or banded with yellow but very variable in colour pattern as are the wings.

### KEY TO MALES AND FEMALES

1 Mesoscutellum shining, almost impunctate . . . . . . . . 2

– Mesoscutellum at least partly dull with dense punctures or surface sculpture . 3

2 (1) Pubescence on head and thorax silvery, not infuscate. 11–13 mm. ♂ not seen. S.E. EUROPE and E. MEDITERRANEAN . . . ***kiefferi*** (Konow)

– Pubescence on head and mesonotum infuscate. 11–13 mm. C. and S. EUROPE, E. MEDITERRANEAN to IRAN . . . . . . . ***costata*** Klug

3 (1) Mesoscutellum entirely dull with dense surface sculpture between punctures. Pubescence on head and mesonotum fuscous . . . . . . 4

– Mesoscutellum with some shining areas anteriorly between the punctures . 5

4 (3) Abdomen black except at most for ± yellow tergite, and occasionally also with yellow flecks on 2nd and 4th, but ♂ often entirely black. Legs entirely black. Inner hind tibial spur more than half length of basitarsus. Wings usually entirely fuscous in ♂, but in ♀ often flavous basally. 11–15 mm. C. EUROPEAN ALPS and E. MEDITERRANEAN . . . . . ***caucasica*** Eversmann

– Abdomen with 3rd to 7th tergites (♀) or 3rd and 4th (♂) margined apically with yellow and legs with yellow tibiae and tarsomeres, flecked with brown at their apices. Inner hind tibia scarcely half as long as basitarsus. Wings of ♀ flavous ± infuscate apically. 12–14 mm. C. EUROPEAN ALPS ***stecki*** (Konow)

5 (3) Abdomen or legs ± marked with yellow. Inner hind tibial spur longer than apical width of tibia. Wings sometimes ± flavous . . . . . . 6

– Entirely black species with strongly infuscate wings. Inner hind tibial spur about as long as apical width of tibia. 13–14 mm. E. MEDITERRANEAN ***violascens*** (Konow)

6 (5) Abdomen with 1st tergite black. Scutellum strongly convex, gibbous . . 7

– Abdomen with 1st, 3rd, 4th and sometimes 2nd, 5th and 6th tergites flecked or margined apically with yellow, as also is often the pronotum; otherwise black, except for paler tibiae and tarsi. Mesoscutellum only slightly convex in middle. 12–15 mm. ♂ not seen. TURKESTAN . . . ***bractea*** Enslin

7 (6) Fore wings fuscous throughout and either stigma dark brown or pubscence on head and thorax partly fuscous . . . . . . . . 8

– Fore wings flavous basally with infuscate apices and yellow stigma. Pubescence on head and thorax silvery. 10–12 mm. EUROPE and SIBERIA **rossii** (Panzer)

8 (7) Stigma and costa of fore wing yellow or brown. 12–14 mm. C. and S. EUROPE **bifasciata** Müller

– Sigma and costa of fore wing infuscate. (? subspecies of preceding). 11–13 mm. ♂ not seen. E. MEDITERRANEAN . . . . . . **diversipes** Mocsáry

### ***Tenthredo kiefferi*** (Konow)

TURKEY, S.W., S. and C.: Aydin (2); Antalya (5 and 14); Mersin (7, 12 and 14); Ankara (12, 14, 15, 21, 35 and 37); Corum (2); Amasya (2, 3 and 7); Kayseri (3 and 4); Sivas (3). Up to 1,600 m. in Mersin. 69 ♂, 93 ♀.

S.E. EUROPE, LEBANON, ISRAEL and TURKEY.

### ***Tenthredo costata*** Klug

TURKEY, C., N.E. and E.: Nigde (5); Ankara (15); Amasya (7); Sivas (3); Giresun (3); Artvin (2); Erzurum (4 and 6). 700–1,700 m., 2 ♂, 11 ♀.

C. and S. EUROPE, TURKEY and IRAN.

### ***Tenthredo caucasica*** Eversmann

TURKEY, N.E. and E.: Trabzon (3, 14, 15 and 16); Gumusane (10); Erzurum (6). 1,400–2,000 m., 33 ♂, 60 ♀.

EUROPEAN ALPS (France and Switzerland), TURKEY and TRANSCAUCASIA.

### ***Tenthredo violascens*** (Konow)

TURKEY, E.: Erzurum (6). 13 ♀.

Also TRANSCAUCASIA.

### ***Tenthredo diversipes*** Mocsáry

SYRIA, LEBANON and ISRAEL.

## The *ZONULA*-group

### KEY TO MALES AND FEMALES

1 Flagellum of antenna mainly black. Head scarcely swollen behind eyes or ± punctate above. Wings subhyaline; stigma infuscate apically . . 2

– Flagellum of antenna mainly yellow. Head strongly swollen behind eyes and impunctate above. Wings yellowish throughout; stigma yellow with brown apex.
Occipital carina continues only up to level with top of eyes, being obsolete behind temples. S.E. EUROPE and E. MEDITERRANEAN . **flavipennis** Brullé

2 (1) Tongue long (prelabium longer than greatest measure of eye). Occipital carina obsolete behind upper half of eyes, temples and postocellar region. Frontal area densely punctate. Clypeus excised to only about one-third of its total length. Abdomen with 1st tergite black, but with whole of 4th and 5th segments yellow above and often 3rd and 6th laterally . . . . 3

– Tongue normal (prelabium shorter than greatest measure of eye). Occipital carina defined along whole hind margin of head except behind postocellar region. Frontal area sometimes shining with sparse punctures. Clypeus excised to more than one-half its total length. Abdomen with ± 1st, whole of 5th, sometimes 4th and apices of some of the following tergites yellow . 4

3 (2) Frontal area deeply concave in the middle to a depth and size much greater than that of an inverted ocellus. Antenna with 1st segment yellow. S.E. EUROPE and E. MEDITERRANEAN . . . . . . ***dialeuca*** (Konow)

– Frontal area not concave in the middle to a depth as great as an inverted ocellus. Antenna entirely black. C. and S. EUROPE and E. MEDITERRANEAN to IRAN . . . . . . . . . ***frauenfeldi*** Giraud

4 (2) Mesopleura above dull with dense surface sculpture . . . . . . 5

– Mesopleura above shining between the follicles of dense pubescence . . 6

5 (4) 1st antennal segment and tegula mainly yellow. Frons densely punctured and lower inner orbits dull with dense surface sculpture. C. and S. EUROPE and N. AFRICA . . . . . . . . ***distinguenda*** (R. v. Stein)

– 1st antennal segment entirely, and tegula mainly, black. Frons sparsely punctured and lower inner orbits shining between surface sculpture. E. MEDITERRANEAN . . . . . . . ***hyrcana*** sp. n. (p. 172)

6 (4) Hind femur tipped with black at apex only. Antenna with one or two basal segments mostly yellow. Hind tibia and tarsus of ♀ marked with black or dark brown. C. and S. EUROPE, N. AFRICA and E. MEDITERRANEAN ***zonula*** Klug

– Hind femur with most of inner side black. Antenna entirely black. Hind tibia and tarsus of ♀ marked with reddish brown. EUROPE ***amoena*** Gravenhurst

## ***Tenthredo flavipennis*** Brullé

*Allantus lautus* Konow.
*A. luminosus* Konow, **syn. n.**

TURKEY, E.: Gumusane (11); Erzurum (6). 1,700–1,800 m.

S.E. EUROPE, TURKEY and TRANSCAUCASIA.

## ***Tenthredo dialeuca*** Konow

*Allantus jugalis* Konow, **syn. n.**

TURKEY, N. and E.: Samsun (8); Gumusane (10); Erzurum (15). Up to 2,300 m., 1 ♂, 4 ♀.

S.E. EUROPE, TURKEY and TRANSCAUCASIA.

## ***Tenthredo frauenfeldi*** Giraud

*Allantus helveticus* Konow, **syn. n.**
*A. merceti* Konow, **syn. n.**
*A. montanus* Enslin, 1910.

TURKEY, N. and E.: Samsun (5); Gumusane (10). Up to 1,800 m., 1 ♂, 2 ♀. IRAN: Mazandaran, Kalar Dasht, Sardab, Rud Valley, 3 km. above Rudbarak, 1,500 m., 1 ♀, 17.iv.1966 (*D. B. Baker*).

C. and S.E. EUROPE, TURKEY and IRAN.

### ***Tenthredo zonula*** Klug

*Allantus similis* Mocsáry.
*A. nazareensis* André, **syn. n.**
*A. serena* Konow, **syn. n.**

TURKEY, N.W., W., S.W., S., C., N.E. and E.: Istanbul (3); Bursa (2 and 14); Aydin (2); Mugla (9 and 10); Antalya (9 and 10); Nigde (5); Ankara (12); Corum (2); Amasya (2, 3 and 7); Artvin (2); Erzincan (1); Erzurum (5, 6 and 14). Up to 2,250 m. in the east, 50 ♂, 35 ♀.

C. and S. EUROPE, ISRAEL, SYRIA, LEBANON and TURKEY.

### ****Tenthredo hyrcana* sp. n.**

(Text-figs. 26, 26a)

♀. Black with the following parts yellow: mandibles, labrum, clypeus, hind margin of pronotum, outer margin of tegula, trochanters extreme base, and apex of femora, tibiae except apices of middle and hind pair and apices of middle and hind tarsomere, apical half of 1st tergite, 5th abdominal segment and apex of 7th, 8th and 9th tergites. Wings subhyaline; base of stigma and costa yellow, apex of stigma and rest of venation piceous. Length 8–9 mm.

*Head* slightly contracted behind and with clearly marked occipital carina, though this is obsolete behind postocellar region; labrum acute in front; clypeus deeply excised in front to depth of more than half total length of clypeus, slightly convex above; flagellum of antenna longer than width of head behind (as 1·3 : 1·0). Frontal area with an 8-shaped medial concavity. Punctation sparse and very fine on ridges of frontal area and lower inner orbits but gena dull with dense surface sculpture.

*Thorax* normal and shining between fine widely-separated punctures on mesonotum. Mesothorax below dull with very dense surface sculpture. Legs normal; inner hind tibial spur scarcely half as long as basitarsus. *Abdomen* dull above with dense transverse alutaceous sculpture. Saw. (Text-figs. 26 and 26a.)

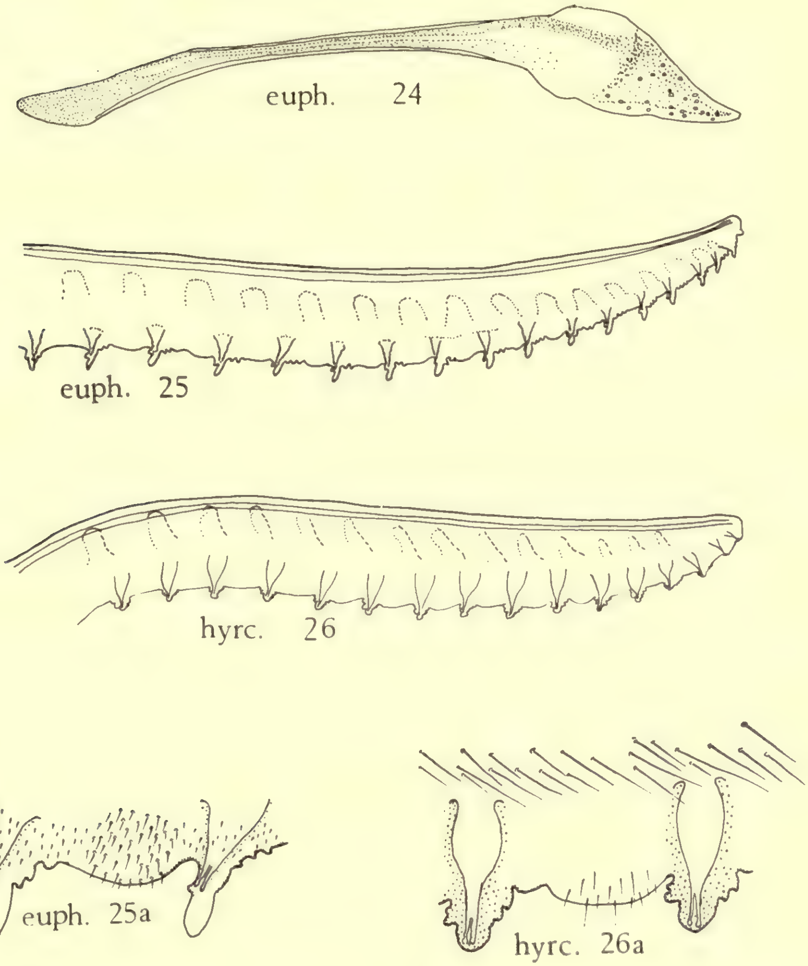
*Pubescence* white and well-developed on head and thorax and in length up to about × 1½ diameter of an ocellus.

♂ as ♀ but that the legs are much paler (the whole of the front legs are yellow except for the spurs, the claw bearing segment and extreme bases of other segments; the middle legs except for the tarsus and an outer black line on the tibia and the hind legs except for the base of the coxae, the apical half of the femur together with the whole tibia and tarsus which are black), the costa is darker, the 1st tergite is pale only on the apical margin and ± the 3rd–5th sternites of the abdomen.

Holotype ♀. TRANSCAUCASIA: Armenia, Delizhan, 1,500–2,200 m., 16.vi.1934 (*A. N. Zhelochovtsev*). B.M. (N.H.).

Paratypes. TRANSCAUCASIA: 1 ♂ (same data). TURKEY: Ankara, Idris Dagi, 1,300 m., 1 ♀, 30.vi.1962 (*Guichard & Harvey*); Amasya, 500 m., 12 ♂, 22–23.v.1959 (*Guichard*), 460 m., 2 ♂, 1 ♀, 2–6.vi.1959; Erzurum, Ispir, 20 kms on Ikisdere Rd., 700 m., 1 ♂, 2.vi.1962 (*Guichard & Harvey*). B.M. (N.H.).

This species is differentiated in the key above from *T. distinguenda* Stein, to which it is most closely related. According to Dr. Zhelochovtsev this species was recognized and named " *Allantus hyrcanus* " by Gussakovskiĭ in his MSS on the Tenthredininae in the Faune de l'URSS before the war, but was never published. I have therefore



FIGS. 24–26. 24. *Tenthredo euphorbiae* sp. n. penis-valve. 25–26. *Tenthredo* saws: 25, *euphorbiae* sp. n.; and 26, *hyrcana* sp. n. 25a–26a. Enlarged 10th and 11th teeth from apex of saws: 25a, *euphorbiae* sp. n.; 26a, *hyrcana* sp. n.

selected as the holotype the specimen sent to me by Zhelochovtsev, bearing the name given by Gussakovskiĭ.

## The *MACULATA-TEMULA*-groups

### KEY TO MALES AND FEMALES

1 ♀ Abdomen only one tergite (3rd) or two (3rd and 4th) entirely yellow; 5th tergite at least partly black; ♂ with underthorax pale. Mesopleura with angular projection. Hind claws with acute basal lobe. 10–12 mm. (*temula* sspp.) 2

– ♀ Abdomen with two tergites (4th and 5th) entirely yellow or orange; 3rd tergite at least mainly black; ♂ with underthorax black. Mesopleura without angular projection. Hind claws without basal lobe. 12–16 mm. (*maculata* complex) 4

2 (1) ♂ has 8th tergite with at most apical margin yellow; ♀ has apex of abdomen with at most 8th and 9th tergites broadly yellow and a small fleck in the middle of the 7th . . . . . . . . . . . . . . 3

– ♂ has 8th tergite with at least apical half yellow and ♀ apex of abdomen has at least a large fleck of yellow on the 7th tergite and mostly has yellow on 6th–9th tergites.

Scutellum sharply raised so as to form right angle in profile. ♂ 3rd tergite entirely yellow and ♀ 4th tergite black-flecked medially, scutellum all black. 7
BRITAIN, S.W. FRANCE, N. SPAIN and ITALY . . ***temula celtica*** Benson

3 (2) ♂ 3rd tergite entirely yellow; ♀ 4th tergite with medial fleck of black. Scutellum flatter, with front face more shining and with no yellow fleck. C. EUROPE (excluding SPAIN and ITALY) . . . ***temula temula*** Scopoli

♂ 3rd tergite with medial black fleck; ♀ with 4th as well as 3rd tergite entirely yellow. Scutellum forming almost a right angle in profile and often with yellow fleck. E. MEDITERRANEAN . . . . ***temula xanthaspia*** Enslin

4 (1) Middle and hind coxae and trochanters mainly, and hind femur entirely, black in both sexes. ♀ abdomen with 4th and 5th segments pale yellow; ♂ abdomen pale yellow except for the ± infuscate 1st and 2nd tergites and two apical segments. ♂ tarsus strongly swollen so that in ventral view the 2nd and 3rd tarsomeres are less than twice as long as broad (Text-fig. 29) (*maculata* sspp.) 5

– Middle and hind coxae and trochanters mainly pale and hind femur pale at base in both sexes. ♀ abdomen with 4th and 5th segments orange above and pale yellow below; ♂ abdomen orange above and pale yellow below except for ± infuscate first 2 tergites. ♂ tarsus less strongly swollen so that in ventral view the 2nd and 3rd tarsomeres are more than twice as long as broad (Text-fig. 30). E. MEDITERRANEAN . . . . . . . ***vestita*** André

5 (4) Hind tibia infuscate apically. ♀ with 2nd and 6th–8th tergites not marked with yellow. . . . . . . . . . . . . . . . 6

– Tibiae not infuscate apically. ♀ with 2nd, 3rd, 6th and 7th tergites flecked with yellow laterally and 6th–9th tergites with medial apical margins yellow. ITALY, N. Appenine Mountains . . ***maculata diana*** ssp. n. (p. 174)

6 (5) Scutellum, tengula and hind edge of pronotum marked with yellow in ♀. W. and C. EUROPE and ITALY (except N. Appenines) ***maculata maculata*** Geoffroy

– Thorax entirely black except for narrow outer edge of tegula. Hungarian Plain (CZECHOSLOVAKIA, HUNGARY and AUSTRIA) . ***maculata semseyi*** Mocsáry

## [*Tenthredo maculata diana* ssp. n.

♀. Black with the following parts yellow: labrum, clypeus, posterior half of pronotum, tegula, scutellum, fleck on metapleura and on fore and middle coxae, trochanters and front of fore and middle femora, all tibiae and tarsi, 4th and 5th segments of abdomen together with a lateral fleck each side of 2nd, 3rd and 6th tergites and medial hind margin of 6th–9th tergites.

*Wings* subhyaline, with costa, front of subcosta and veins in anal regions, yellow; stigma and rest of venation black.

Structure as in *T. maculata* but mesoscutellum is more convex medially. 13–14 mm. long.

Holotype ♀. ITALY: Emilia, Mt. Bretra, 1.v.1912 (*A. Fiori*) (Genova Mus.).

Paratypes. ITALY, Emilia, La Lama, 1 ♀, 10.vi.1962 (*A. Servadei*) (Padova Mus.); Marches, Mt. Catria, 1 ♀, v.1933 (*Alzona*). B.M. (N.H.)].

### ***Tenthredo vestita*** André

Turkey, C., N., N.E., E.: Amasya (3, 6 and 13); Samsun (17); Gumusane (14); Trabzon (3, 4 and 15); Erzurum (6). 500–1,400 m., 23 ♂, 24 ♀.

Turkey and Transcaucasia.

### ***Tenthredo temula xanthaspis*** Enslin

Turkey, N. and N.E.: Sinop (2); Trabzon (3 and 4); Rize (5); Artvin (3). 900–1,400 m., 3 ♂, 7 ♀.

Subspecies only in Turkey and Transcaucasia. Species otherwise confined to Europe.

### The *VESPIFORMIS-SCROPHULARIAE*-group

These species are coarsely punctured on the head, which is often swollen behind the eyes; the antennae often have the flagellum yellow and the wings often have infuscate patches.

### ***Tenthredo marginella*** Fabricius

Turkey, W., N.E. and E.: Bursa (13); Trabzon (14); Gumusane (4). 1 ♂, 3 ♀.

Europe, Turkey and Transcaucasia.

### ***Tenthredo zona** Klug

Turkey, S.W.: Mugla (10). 1 ♀.

Not previously recorded outside Europe.

### ***Tenthredo vespa*** Retzius

Turkey, N.E.: Trabzon (15). 1 ♀.

Europe, Turkey, Transcaucasia and Siberia.

### ***Tenthredo scrophulariae*** L.

Turkey, C.: Tokat (1); Sivas (2). 3 ♂, 2 ♀.

Europe, Turkey and Transcaucasia.

### ***Tenthredo excellens*** (Konow)

†*Allantus persa* Konow.

Turkey, S., C. and E.: Mersin (12 and 15); Ankara (9, 12, 31, 37 and 39); Amasya (1 and 7); Kayseri (3); Sivas (3); Erzurum (7, 8 and 9). 5,000–2,300 m., 21 ♂, 24 ♀.

N. Iran: Elburz Mountains, 1966 (*D. B. Baker*).

S.E. Europe, Turkey, Transcaucasia and Iran.

### ***Tenthredo cinctipleuris*** (Enslin)

TURKEY, S. and E.: Mersin (7); Gumusane (5); Erzurum (6). 14 ♂, 12 ♀.

IRAN: Elburz Mountains, N. side of Kandara Pass, 2,360 m., 1 ♂, 1 ♀, 9.vi.1965 (*D. B. Baker*).

EUROPE, TURKEY, TRANSCAUCASIA and IRAN.

### *****Tenthredo propinqua*** Klug

TURKEY, N.: Kastamonu–Cankiri Border (2). 2,000 m., 1 ♂.

S.E. EUROPE and TURKEY.

### ***Tenthredo luteocincta*** Eversmann

TURKEY, N.E.: Trabzon (14 and 15). 3 ♀.

TURKEY, TRANSCAUCASIA and S.E. RUSSIA.

### ***Tenthredo reitteri*** (Enslin)

*Allantus lituratus* Mocsáry.

TURKEY, W., C., N.E. and E.: Kutahya (9); Cankiri (4); Trabzon (4, 14, 15 and 16); Gumusane (7). 1,400–2,500 m., 42 ♂, 23 ♀.

TURKEY and TRANSCAUCASIA.

### ***Tenthredo lauta*** (Konow)

TRANSCAUCASIA.

### ***Tenthredo luminosa*** (Konow)

TURKEY.

### The *ARCUATA*-group

The species of this group were revised by Benson (1959).

### ***Tenthredo schaefferi*** Klug

Outside C. and S.E. EUROPE, a few specimens of f. *perkinsi* of this species were found in N. IRAN: Elburz Mountains, 2,500–3,200 m. (see Benson, 1959).

### *†***Tenthredo acerrima*** Benson

TURKEY, N.E. and E.: Trabzon (14 and 15); Artvin (4); Gumusane (8). 1,400–2,450 m., vi–viii, many ♂ and ♀.

EUROPE and TURKEY.

### *†*Tenthredo titania* Benson

TURKEY: Trabzon, Zigana Dagi, 1,400 m., plentiful vii–viii, 1959–60, and Soganli Gecidi, 2,600 m., 40 ♂, 84 ♀, v–vii.1960–62 (*Guichard & Harvey*).

TRANSCAUCASIA and TURKEY.

### *Tenthredo trivittata* (André)

†*Allantus kussariensis* Konow, **syn. n.**

TRANSCAUCASIA.

### **Tenthredo euphorbiae* **sp. n.**

(Text-figs. 24, 25, 25a)

♀. Green with the following parts black: head above the clypeus (except for gena and lower outer orbits), with antenna (except underside of flagellum), prothorax (except pronotum behind), mesothorax (except tegula, scutellum and its post-tergite, the posterior half of the episternum, the epimeron and the sternum), a posterior line on the hind and middle coxae and femora, on all the tibiae and tarsi, and on the abdomen a transverse fleck on the middle basal part of each tergite. Wings hyaline; stigma, costa, subcosta and anal cells green, rest of venation piceous. *Length* 8–9 mm.

*Head* dull with coriaceous sculpture, slightly contracted behind with occipital carina well developed from gena to post-ocellar region. Labrum rounded in front. Clypeus excised in front of a depth less than half the total length of clypeus (1·0 : 2·5), scarcely convex, shining with only obsolescent punctures and surface sculpture. Eyes closer together in front than the length of an eye (1·0 : 1·4). Malar space about half diameter of front ocellus. Antenna more than × 1½ as long as width of head behind eyes (1·6 : 1·0); 3rd segment = 4th + 5th. Distance between antennal sockets about the same as the diameter of a socket. Antennal crests project less than half the distance between them; crests continuous with lateral walls of frontal area. Posterior ocelli closer together than distance from occipital carina (1·0 : 1·2) and half the distance from nearest eye margin (1·0 : 2·0); postocellar region clearly defined laterally by deep furrows, and almost × 2 as broad as long (1·9 : 1·0).

*Thorax* normal; dull with dense coriaceous sculpture; mesoscutellum slightly roundedly convex; mesopleura without any raised protuberance. Legs with hind femur almost as long as tibia (1·0 : 1·3); hind tarsus longer than tibia (1·1 : 1·0); inner hind tibial spur about half the length of basitarsus; tarsal pulvillus on hind basitarsus about as long as apical width of basitarsus. Claws sub-bifid without basal lobe.

*Abdomen* with typical transverse alutaceous sculpture above. Hypopygium not emarginate laterally. Sawsheath slender and about two-thirds the length of hind tibia. Saw (Text-figs 25 and 25a).

*Pubescence* fuscous on upper head where it is up to a length greater than the diameter of an ocellus; colourless on thorax and shorter than diameter of an ocellus.

♂ as ♀ but the underthorax and abdomen are almost entirely green except for the black sutures between the sclerites, and the medial basal halves of the 1st and 2nd tergites. The eyes converge more strongly in front where the distance between them to the length of an eye is as 1·0 : 1·7. The malar space is but one-quarter as long as the diameter of the front ocellus. The antenna is almost twice as long as the width of the head behind the eyes.

Hind ocelli closer together than from occipital carina as 1.0 : 1.4 and then from nearest eye margin as 1·0 : 2·5. Postocellar region wider than long as 2·5 : 1·0. Tarsal pulvillus on hind basitarsus only about one-third the width of basitarsus, though one-half the width on front legs. Penis-valve as in Text-fig. 24.

Holotype ♀. TURKEY: Trabzon, Soganli Gecidi, 2,600 m., on flowers of *Euphorbia*, 27.v.1962 (*Guichard & Harvey*). B.M. (N.H.).

Paratypes. Same data, 6 ♂, 47 ♀. B.M. (N.H.).

This remarkable species is to be distinguished at once from all others in the *arcuata*-group by the green ground colour and by the punctation of the head and thorax, which are dull all over, with dense even coriaceous surface sculpture without coarser punctures: in all the other species known to me the head and thorax are coarsely punctured, ± shining in places between the punctures especially on the temples of the head and mesoscutellum, but the underthorax and frons of head are usually dull with coarse surface sculpture.

## *CUNEALA* Zirngiebl, 1956

This group of species was previously included in *Tenthredo* but is readily recognized by the long mouthparts (prelabium longer than greatest eye-measure) and the subtruncate apex of the labrum.

Whether this genus is the true *Cuneala* is not entirely certain, as Zirngiebl gave no full description of either the genus or type-species *C. tricolor*. He says merely that the mouthparts are elongate as in *Amauronematus*,[7] the clypeus prism-shaped and the colour as in *Tenthredo parviceps* (Konow). He also says that the type is deposited in the Staatliches Naturkunde Museum, Stuttgart (where unfortunately it cannot now be found), and in correspondence Dr. Zirngiebl tells me he has no other representative of this species in his own collection.

### KEY TO MALES AND FEMALES

1 Face and tegula entirely black. Hind tibia and tarsus yellow, with orange apices or almost entirely infuscate. Clypeus with coarse irregular punctures obscuring the obsolescent reticulate surface sculpture. Hind tarsus of ♂ longer, but of ♀ shorter than hind tibia. ♀ either with densely pubescent basal tergites or with shining interspaces between punctures on scutellum . 2

– Face or tegula ± marked with yellowish white. Hind tibia and tarsus yellow with infuscate apices. Clypeus with evident reticulate surface sculpture all over between scattered shallow punctures. Hind tarsus of both ♂ and ♀ longer than hind tibia. ♀ with 3 basal tergites shining and with only very sparse pubescence, but scutellum and mesopleura dull with dense microsculpture in the interspaces between punctures . . . . . . . 3

2 (1) ♀ with basal tergites dull all over with dense pubescence; ♂ middle tergites without red markings. Interspaces between punctures on mesoscutellum dull with dense surface sculpture.

♀ body black with yellowish white apical margins to 4th, 5th and 6th tergites and sometimes 1st and 7th also. Legs black with tibia and tarsus yellowish white with orange apices; ♂ as ♀ but apical margins usually restricted to 4th and 5th tergites. 10–12 mm. Mountains of C. EUROPE. **koehleri** (Klug)

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[7] This is not strictly true of what I here call *Cuneala*, because in *Amauronematus* it is the prementum and cardo that are elongate, while the glossa, paraglossa, galea and palps are shorter than in the species of the related genus *Nematus*, which has not got elongate mouthparts (c.f. Benson, 1958, figs. 388 and 389). In the group called here *Cuneala* all the mouthparts are lengthened, especially the glossa, paraglossa and palps.

– ♀ with 1st–3rd tergites shining medially with only very short and sparse pubescence; ♂ middle tergites usually ± marked with red. Interspaces between punctures on mesoscutellum mostly shining with only obsolescent surface sculpture.

Colour extremely variable: ♂ and ♀ can be as in *koehleri*, but more commonly the 3rd and often 4th and 5th tergites in ♀ are ± marked with orange or more extensively yellow (of 140 ♀ in B.M. only 18 are without some orange on abdomen); and in the commonest form of ♂ the whitish apical margins to the tergites are missing and the 3rd and 4th segments are entirely covered by a red band, while the legs are entirely black (85 out of 96 ♂ in B.M. are coloured like this); in some forms the body and legs are entirely black (f. ***atrata*** André). 9·5–12 mm. Mountains of TURKEY and eastwards to N. IRAN (1,000–2,400 m.) . . . . . . . †***confinis*** (Konow, 1886)

3 (1) Larger species, 11–14 mm. long. Face with clypeus, labrum and base of mandibles yellowish white. Clypeus with apical excision about as deep as half its total length. Scutellum flattened medially.

Abdomen black with 1st tergite ± white, and 3rd–6th with entire apical margins and 2nd and 7th with apical margins laterally white . . . 4

– Smaller species, 8–10 mm. long. Face with clypeus and labrum black in ♀ but ± white in ♂. Clypeus with apical excision usually about one-third and at most less than half its total length. Scutellum evenly convex, not flattened medially.

Tegula black with pale apical margin. ♀ abdomen black with 1st and 3rd–7th tergites ± margins apically with white and 3rd and 4th may be ± orange; ♂ black but 3rd or 3rd and 4th tergites may be ± yellow. Pubescence on head and thorax long, so that the longest hairs are about as long as diameter of an ocellus. Mesonotum with interspaces between the punctures dull with surface sculpture. TRANSCAUCASIA and N. IRAN . †***longipes*** (Konow)

4 (3) Tegula mainly yellow with a small black basal spot. Pubescence on head, mesonotum and mesopleura shorter (longest hairs up to three-quarters of diameter of lateral ocellus). ♂ and ♀ with 1st tergite enitrely white. Mesonotum with interspaces between punctures dull with surface sculpture. TURKEY . . . . . . . †****amasiensis*** (Kriechbaumer) **sp. rev.**

– Tegula mainly black with a yellow apical margin. Pubescence on head and thorax longer (longest hairs about as long as diameter of lateral ocellus). 1st tergite in ♀ entirely white but in ♂ black with only apical margin white. Mesonotum with interspaces between punctures shining. S.E. EUROPE (HUNGARY, JUGOSLAVIA, ALBANIA, CORFU, GREECE) . . ***dahli*** Klug[8]

## †*Cuneala confinis* (Konow, 1886)

†*Allantus parviceps* Konow, 1898.

TURKEY, C., N., N.E. and E.: Kayseri (1); Bolu (1 and 3); Cankiri and Kastamonu (2); Trabzon (3, 4, 14, 15 and 16); Gumusane (7 and 8); Rize (8). 1,000–2,500 m., 96 ♂, 135 ♀, 12.v–9.viii. Many on flowers of *Geranium psilostemum* Ledeb.

IRAN: C. Elburz, Kandavan Pass, 9 km. above Siahbishe, 2,350 m., 1 ♀, 7.vi.1966 (*D. B. Baker*). Taken in " Lush vegetation (? former cultivation) bordering stream in semi-desert (thorn-cushion) zone ".

TURKEY, TRANSCAUCASIA and IRAN.

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[8] Synonym of *C. dahli*: *Allantus xanthorius* Kriechbaumer, **syn. n.**

### ***Cuneala longipes*** (Konow)

IRAN: Mazandaran, Chalus–Shahsavar Coast of Caspian Sea, 34 ♂, 21 ♀, 24.iii to 6.vi.1966, and 9 ♂, 5 ♀, 20.iv to 11.v.1967 (*D. B. Baker*). Mainly collected from flowers of *Ranunculus* in woodland and in forest clearings.

IRAN and TRANSCAUCASIA.

### ***Cuneala amasiensis*** (Kriechbaumer)

TURKEY, W., S.W. and C.: Bursa (2); Aydin (2); Ankara (14); Corum (2); Amasya (1, 2, 3, 5, 7, 9 and 14). 50 to 560 m., 25 ♂, 28 ♀.

Not known outside TURKEY.

## TENTHREDININAE

## SCIAPTERYGINI

### ***ELINORA*** Benson

The following syntypes of *Allantus* found to belong to this genus in Konow's collection have been examined and the lectotypes labelled. The species are differentiated in the keys that follow.

*Allantus andrei* Konow. LECTOTYPE ♀ selected from 1 ♂ and 1 ♀.

*A. antigae* Konow. LECTOTYPE ♀, with abdomen still intact, labelled " Barcelona " (i.e. " Hisp. prov. Catalonia " of original description), selected from 2 ♂ and 2 ♀ one of which had its saw mounted but no abdomen intact.

*A. contiguus* Konow. LECTOTYPE ♀ with mesopleuron bearing only a yellow fleck as in original description, selected from 1 ♂ and 4 ♀, three of which have mesopleura almost entirely yellow.

*A. dusmeti* Konow. LECTOTYPE ♀, selected from 1 ♂ and 1 ♀.

*A. nigritarsis* Konow. LECTOTYPE ♀, selected from 1 ♂ and 1 ♀.

*A. obscuratus* Konow. LECTOTYPE ♀, with yellow hind tibia and tarsus as in original description, selected from 2 ♂ and 4 ♀, three of which have hind tibia infuscate behind. *Elinora obscurata* (Konow) **comb. n.**

*A. striatipes* Konow. LECTOTYPE ♀ selected from 1 ♂ and 1 ♀.

In the keys the following species, described from S.E. EUROPE or TRANSCAUCASIA, and thought also to belong to this genus, had to be omitted as no specimens have been available for study: *Allantus frivalskyi* Mocsáry, *A. limbifer* Mocsáry and *A. pubescens* André.

The key to the males will be found to be more unsatisfactory than that to the females, on which most of the species are based, as many of the females have not yet had males correlated with them.

#### KEY TO FEMALES

1 Orbits extensively yellow (at least hind orbits lined with yellow for their whole length) . . . . . . . . . . . . . . . . 2

– At least hind orbits mainly black (at most lower gena yellow) . . . . 6

2 (1) Clypeus with front lobes flat and rounded or truncate apically . . . . 3

– Clypeus with front lobes raised and acute apically. E. MEDITERRANEAN †***maculata*** (Kriechbaumer)

3 (2) 1st tergite black with at most separated pale flecks. Clypeus with surface flat and ± punctate . . . . . . . . . . . . . . 4

– 1st tergite with a broad yellowish white apical band. Clypeus convex and shining between sparse punctures. CAUCASUS. 7·5–9 mm. . ***ornata*** (André)

4 (3) More punctate species. Mesopleura, scutellum and 1st tergite with evident punctation and sculpture. Abdomen with tergites black and ± laterally pale-margined apically . . . . . . . . . . . . 5

– Sparsely punctate species. Mesopleura, scutellum and 1st tergite shining and almost impunctate. Abdomen with medial orange band covering tergites 2–3 and all tergites with a yellowish white apical lateral fleck each side.

Stigma infuscate apically. Hind tibia with black-tipped apex; inner spur about as long as tibial breadth. 11–12 mm. MOROCCO ***dulcis*** sp. n. (p. 184)

5 (4) Clypeus dull with fine surface sculpture. Stigma infuscate apically. ISRAEL. 10·5 mm. . . . . . . . . . . . ***stolida*** sp. n. (p. 185)

– Clypeus shining between coarse punctures. Stigma ± unicolorous.

This species varies greatly in the amount of yellow on the orbits, antennal segments and tergites. In S.W. EUROPE the coxae are mostly black and the femora, tibiae and tarsi ± black-lined; in some of the N. African forms the legs are almost entirely pale. S.W. EUROPE and N. AFRICA (PORTUGAL, SPAIN, MOROCCO, ALGERIA (including Ahagger Mountains in Sahara Desert), TRIPOLITANIA and CYRENAICA) . . . . . . ***xanthopus*** (Spinola)[9]

6 (1) Tegula at least partly black . . . . . . . . . . . 7

– Tegula entirely pale . . . . . . . . . . . . . . 10

7 (6) Inner hind tibial spur longer than apical width of tibia . . . . . 8

– Inner hind tibial spur shorter than apical width of tibia . . . . . 9

8 (7) Antennae and mesopleura entirely black. Head and thorax dull with surface sculpture between dense punctures. 8·5–10·5 mm. SPAIN and N. AFRICA ***limbalis*** (Spinola)[10]

– Antenna with basal segment and mesopleura ± with yellow fleck. Head and mesonotum shining between fine punctures, though on mesopleura surface is dull between the punctures. 10–11 mm. SPAIN and N. AFRICA (MOROCCO and ALGERIA) . . . . . . . . . . ***vilarrubiai*** (Conde)

9 (7) Gena pale below. Abdomen black apart from *apical* lateral margins of tergites. 8–11 mm. N. AFRICA . . . . . . . . . ***deserta*** (Enslin)[11]

– Gena entirely dark. Abdomen with red girdle covering segments 3–5 and segments from 6 and following with increasing white apical margins so that 9 is entirely white. 9 mm. E. MEDITERRANEAN . . . . ***asiatica*** (Enslin)

10 (6) 2nd and following tergites black with yellowish white lateral apical marginal flecks which, on following tergites, become more extensive till they form continuous apical bands, and on posterior segments cover the whole tergites . 10

– 2nd or 3rd and following tergites mainly orange so that the lateral apical yellowish white flecks, which become continuous apical bands on posterior segments, are inconspicuous.

Stigma scarcely darker apically than basally. 8·5–10·5 mm. E. MEDITERRANEAN to N. IRAN . . . . . . . . ***coniensis*** (Enslin)

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[9] Synonyms of *E. xanthopus*: †*Allantus pectoralis* Kriochbaumer, **syn. n.** †*Macrophya cognata* Kirby, **syn. n.** †*M. corynetes* Kirby, **syn. n.** †*M. jugurtha* Kirby, **syn. n.** †*Allantus striatipes* Konow, **syn. n.** †*A. andrei* Konow, **syn. n.** †*A. tunetensis* Konow, **syn. n.** *Tenthredo adequata* Enslin, 1910, **syn. n.** *Allantus diversipes* Pic, 1925, **syn. n.** *Tenthredo limbergorum* Forsius, 1930, **syn. n.** *T. afra* Benson, 1930, **syn. n.** †*T. sahariensis* Benson, 1954, **syn. n.**

[10] Synonyms of *E. limbalis*: †*Allantus balteatus* Kriechbaumer, **syn. n.** *A. gribodoi* Konow.

[11] Synonym of *E. deserta*: †*Elinora guichardi* Benson, **syn. n.**

11 (10) 1st tergite almost entirely pale and stigma infuscate apically (*pallipes* complex) . . . 11

— 1st tergite with at least broad base black up to one-third of its medial length, or stigma entirely pale . . . . . . . . . . . . 14

12 (11) Abdomen less extensively pale: 3rd and often following tergites without continuous pale apical band. Front mesonotal lobe entirely black or with at most obsolescent pale flecks. . . . . . . . . . 13

— Abdomen more extensively yellowish white: 3rd tergite with continuous pale apical band and 4th onwards mainly pale. Front mesonotal lobe with conspicuous white lateral borders. 9–10 mm. Turkestan ***pallipes*** (Freymonth)

13 (12) Larger species (11 mm.). Hind femur often with apical half ± black. Scutellum dull and densely punctate, scarcely convex. 11–12 mm. Turkestan †***dissidua*** (Konow)

— Smaller species (8–10 mm.). Hind femur entirely pale. Scutellum shining and sparsely punctate, strongly convex. 9–11 mm. S. and W. Caspian Coast . . . . . . . . . . . . . . ***caspia*** (André)

14 (10) All femora and tibiae ± infuscate behind . . . . . . . . 15

— Femora at most infuscate only at base, and tibiae at extreme apex . . . 17

15 (14) Gena black . . . . . . . . . . . . . . 16

— Gena pale below. N. Africa. 9–10 mm. . . . . . †***obscurata*** (Konow)

16 (15) Scutellum all black. Pronotum and mesopleura almost entirely yellow. Stigma scarcely darker apically. E. Mediterranean. 7·5–8 mm. ***barbalis*** (Enslin)

— Scutellum with pale spot. Pronotum with only hind margin and mesopleura with only a small spot pale. Stigma conspicuously bicoloured with apical half black. N. Africa. 10 mm. . . . . . . ***rufonigra*** (André)

17 (14) Wings subhyaline. Prelabium shorter than head capsule. Abdomen with at least posterior tergites laterally pale-margined apically. 1st tergite often ± punctate and with surface sculpture between punctures. Inner hind tibial spur shorter than apical width of tibia . . . . . . . 18

— Wings infuscate. Prelabium longer than head capsule. Abdomen black with middle tergites (3–5) red but other not pale-margined apically even laterally shining and very sparsely punctured species: 1st tergite impunctate and without surface sculpture. Inner hind tibial spur longer than apical width of hind tibia. 10–11 mm. S.E. Europe . . . . †***sabariensis*** (Mocsáry)

18 (17) Abdomen with unbroken lateral yellow stripe (tergites are entirely yellow laterally), or more extensively yellow. Antenna usually 8-segmented. Clypeus ± shining between coarse punctures with front lobes acute or truncate. 1st tergite often without pale apical stripe. W. Europe and N. Africa . . . . . . . . . . . . . . . 19

— Abdomen without lateral yellow stripe (tergites are black basally right up to lateral margin). Antenna 9-segmented. Clypeus dull with dense surface sculpture and with front lobes pressed flat. 1st tergite with continuous pale apical stripe. 10–12 mm. C. Europe to E. Mediterranean ***flaveola*** (Gmelin)

19 (18) 1st tergite without pale apical band dorsally . . . . . . . . 20

— 1st tergite with pale apical band ± developed dorsally. 4th and following tergites with continuous pale apical band. 10–12 mm. Atlantic Europe (England, France, Belgium, Portugal, Spain) . †***dominiquei*** (Konow)

20 (19) Stigma unicolorous yellow scarcely darker apically
Pale lateral stripe of abdomen with straight upper margin . . . . 21

— Stigma at least partly infuscate . . . . . . . . . . . . 22

21 (20) Clypeus slightly convex and shining between scattered punctures. 7·5–10 mm. Spain and N. Africa . . . . . . . . ***algeriensis*** (Magretti)[12]

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[12] Synonyms of *E. algeriensis*: †*Allantus tricolor* Kriechbaumer, **syn. n.** †*A. contiguus* Konow, **syn. n.**

— Clypeus pressed flat against labrum and with dense surface sculpture between punctures. E. Mediterranean. 7·5 mm. . . . †***parvula*** (Kriechbaumer)

22 Smaller species (under 8 mm.). Stigma with at least lower half infuscate. Abdomen yellow-brown (? greenish in life) with a continuous black medial-dorsal vitta. E. Mediterranean . . . . †***vittata*** (Kriechbaumer)

— Larger species (10–12 mm.). Stigma with apex infuscate. Abdomen with the basal tergites black and only the lateral portions yellow, but the yellow is progressively more extensive on the apical tergites which beyond the 4th segment have also yellow apical margins. Spain and N. Africa ***baetica*** (Spinola)[13]

## Key to Males

1 Tegulae marked with black . . . . . . . . . . 2

– Tegulae entirely pale . . . . . . . . . . . 8

2 (1) Inner hind tibial spur longer than apical width of tibia. Stigma strongly infuscate apically . . . . . . . . . . . . . 3

– Inner hind tibial spur much shorter than apical width of tibia. Stigma either unicolorous or ± infuscate apically . . . . . . . . . . 4

3 (2) Head above entirely dull with dense surface sculpture. N. Africa (Morocco and Algeria). 8–10 mm. . . . . . . . . ***limbalis*** (Spinola)

– Head with shining unsculptured patches on temples. Spain and N. Africa (Morocco and Algeria). 9–10 mm. . . . . . ***vilarrubiai*** (Conde)

4 (2) Stigma yellow often ± brownish apically. 8–10 mm. . . . . . . . 5

– Stigma black apically with a pale base. 9–10 mm. N. Africa ***rufonigra*** (F. André)

5 (4) Hind femur at least pale-lined on the outer side . . . . . . . . 6

– Hind femur almost entirely black. Stigma brownish. 8–10 mm. N. Africa ***obscurata*** (Konow.) **comb. n.**

6 (5) Clypeus with front lobes rounded or truncate apically and flattened . . 7

– Clypeus with front lobes acute and convex. 9–10 mm. E. Mediterranean ***maculata*** (Kriechbaumer)

7 (6) Head above antennae, mesonotum and mesopleura ± punctate and with fine surface sculpture. 8–10 mm. W. Mediterranean (Spain, Portugal and N. Africa) . . . . . . . . . . ***xanthopus*** (Spinola)

– Head above antennae, mesonotum and mesopleura smooth and shining with at most, sparse obsolescent punctures. 8–9 mm. N. Africa ***deserta*** (Enslin)

8 (1) Abdomen with at least one medial or apical tergite entirely pale. Often over 8 mm. . . . . . . . . . . . . . . 9

– Abdomen yellow-brown with a continuous black medial dorsal vitta and no entirely pale tergites. Hind legs mainly pale yellow except for extreme base of femur, apex of tibia and most of tarsi. Mesopleura yellow above and black below together with mesosternum. Under 8 mm. E. Mediterranean ***vittata*** (Kriechbaumer)

9 (8) Abdominal tergites 1–7 each at least marked with black at the base medially but with the two apical tergites and hypopygium mainly yellowish white. Hind femur marked with black. Wings flavescent with unicolorous yellow stigma often ± brownish below. Large species, 10–12 mm. . . . . 10

– Abdomen with one or more of the middle tergites entirely reddish brown. If the apical tergites and hypopygium are mainly pale then the hind femur is not marked with black. Wings often hyaline and stigma usually infuscate apically or below. Often smaller species . . . . . . . . 11

10 (9) Clypeus with front lobes truncate and flattened. Antenna 9-segmented. 10–11 mm. C. Europe to E. Mediterranean . . . ***flaveola*** (Gmelin)

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[13] Synonyms of *E. baetica*: †*Allantus antigae* Konow, **syn. n.** †*A. dusmeti* Konow, **syn. n.**

— Clypeus with front lobes acute and convex. Antenna 8-segmented. 10–13 mm. E. EUROPE . . . . . . . . . **dominiquei** (Konow)

11 (9) Crests above antennal sockets scarcely project beyond level of middle of the inter-antennal area . . . . . . . . . . . 12

— Antennal crests project strongly beyond level of middle of inter-antennal area . 13

12 (11) Clypeus flat and densely punctate. 7–10 mm.
**algeriensis** Magretti (N. AFRICA); **boetica** (Spinola) (SPAIN); **dissidua** (Konow), **fulveola** (Zhelochovstev) (TURKESTAN) and **parvula** Kriechbaumer (TURKEY)

— Clypeus strongly convex and ± shining between sparse punctures. 8–10 mm. E. MEDITERRANEAN . . . . . . . . . **ornata** (André)

13 (11) Three apical tergites black, each with a yellowish white fleck each side . . 14

— Three apical tergites mainly yellow, each with yellowish white fleck each side and ± a medial black fleck. Mesonotum black except for white fleck on scutellum. 9–11 mm. E. MEDITERRANEAN . . . **coniensis** (Konow)

14 (13) Front lobe of mesonotum with lateral margins white, as is scutellum. Pale lateral flecks on apical tergites reach more than half way to middle of segment. 8–9 mm. TURKESTAN . . . . . . . . **pallipes** (Freymonth)

— Mesonotum usually entirely black. Pale flecks on apical tergites mostly confined to lateral ventral portions of tergites . . . . . . 15

15 (14) Wings ± infuscate, with stigma pale above and infuscate below. Clypeus and mesopleura shining between scattered punctures. Inner hind tibial spur longer than apical breadth of tibia. S.E. EUROPE . . **sabariensis** (Mocsáry)

— Wings hyaline; stigma pale basally and infuscate apically. Clypeus and mesopleura above dull with fine microsculpture between punctures. Inner hind tibial spur shorter than apical breadth of tibia. S. and W. CASPIAN Coast **caspia** (André)

## ***Elinora maculata*** (Kriechbaumer, 1869)

*Allantus syriacus* André.
*A. nigritarsus* Konow.
*Tenthredo aulica* Enslin, 1912.

SYRIA, ISRAEL, TURKEY and TRANSCAUCASIA.

## ***Elinora ornata*** (André, 1881)

*Allantus* †*discolor* Konow.

TRANSCAUCASIA.

## ***Elinora dulcis* sp. n.**

♀. Black with the following parts yellowish white: mandible base, labrum, clypeus, outer orbits to level of top of eyes, basal segment of antenna (rest of antennae missing in unique type), posterior half of pronotum, tegula, meso- and meta-scutella, fleck in middle of mesepisternum, fleck on metapleura, coxae (except their bases), femora, tibiae (except their extreme apices) middle of basitarsi, lateral fleck each side of 1st and 2nd tergites, the 3rd, 4th and 5th tergites except for a lateral black fleck on each and that dorsally these three tergites are fulvous, and there is a lateral yellow fleck on the hind margin of tergites, 6, 7, and continuously on hind margin of 8th and 9th.

*Wings* slightly brownish subhyaline; basal half of stigma, extreme apex of subcosta and basal two-thirds of costa yellow; rest of venation piceous. Length 12 mm.

*Head* slightly swollen behind the eyes and shining with sparse punctation. Clypeus slightly convex but with the front lobes pressed flat and with a few scattered punctures. Frons with a medial groove widening behind. Hind ocelli further apart than from hind margin of head as 1·0 : 0·9, but further from eye margin than from each other (POL : OOL as 1·0 : 1·6).

*Thorax* strongly shining between widely-spaced obsolescent punctures; mesoscutellum evenly convex; post-tergite shorter than shortest measure of a cencher.

*Legs* with inner hind tibial spur about as long as apical breadth of tibia.

*Abdomen* normal.

*Pubescence* on head and thorax pale and up to a length as long as diameter of an ocellus.

Holotype ♀. MOROCCO; Grand Atlas, Idni, 8.v.1941 (*K. M. Guichard*). B.M. (N.H.).

### *Elinora stolida* sp. n.

♀. Black with the following parts yellowish white: mandible base, labrum, clypeus, outer orbits to level of top of eyes, 1st and upper side of 2nd antennal segments, pronotum, tegula, V-shaped outer margin of front mesonotal lobe and fleck on inner side of each of the lateral mesonotal lobes, anterior three-quarters of mesoscutellum, upper half of mesepisternum, small fleck on mesepimeron and on metapleura, coxae (except extreme bases), femora, tibiae (except extreme apices) basitarsus except for a fleck at extreme base and extreme apex, fleck on lateral hind margin of 1st and following tergites progressively longer from the 1st tergite backwards, so that on the 5th and following tergites the hind margin is continuously pale.

*Wings* slightly brownish subhyaline; front half of stigma, costa, subcosta (front half of $Sc + R$) and veins at extreme base of wings yellow; rest of venation piceous. Length 10 mm.

*Head* shining with very fine surface sculptures. Clypeus slightly convex with front lobes pressed flat and the whole surface dull with dense surface sculpture. Frons with a L-shaped medial groove. Hind ocelli further apart than from hind margin of head as 1·0 : 0·7, but further from the eye margin than from each other (POL : OOL as 1·0 : 1·7).

*Thorax* shining between sparse punctures, which become denser at front of mesonotum and in middle of mesonotum, where they are scarcely further apart than the diameter of a puncture. Mesoscutellum slightly convex and not separated medially from the raised centre of the post-tergite which is about as long as the shortest measure of a cencher.

*Legs* with inner hind tibial spur scarcely three-quarters as long as apical width of tibia.

*Abdomen* normal.

*Pubescence* on head and thorax pale and up to a length as long as the diameter of an ocellus.

Holotype ♀. ISRAEL: Jerusalem, 15.iii.1923 (*P. A. Buxton*). B.M. (N.H.).

### *Elinora asiatica* (Enslin)

TURKEY.

### *Elinora coniensis* (Enslin)

*Allantus* (*Tenthredo*) *kareli* Muche, 1962, **syn. n.**

TURKEY: Ankara (57). 1 ♂ and 1 ♀; Kayseri (on flowers of *Lepidium*, Muche, 1962).

N. IRAN: W. Elburz, Qazvin, *c.* 760 m., 2 ♂, 1 ♀, 25.iv.1967 (*D. B. Baker*).

TURKEY, TRANSCAUCASIA and N. IRAN.

### *Elinora caspia* (André)

S.E. RUSSIA, TRANSCAUCASIA and IRAN.

### *Elinora barbalis* (Enslin)

Syria.

### *Elinora flaveola* (Gmelin)

†*Allantus orientalis* Kriechbaumer.

C. and E. Europe and Turkey.

### †*Elinora parvula* (Kriechbaumer) **comb. n.**

Turkey.

### †*Elinora vittata* (Kriechbaumer) **comb. n.**

Israel and Iraq.

## TENTHREDININAE

## SCIAPTERYGINI

### *SCIAPTERYX* Stephens

Previous keys to world *Sciapteryx* were compiled by Konow, 1908, Kuznetzov-Ugamskii, 1929 and the Caucasian species by Dovnar-Zapolskiĭ, 1930.

The following species, from studies of the types, are now placed in other genera as shown:

*Sciapteryx galerita* Konow (Sikkim) = *Tenthredo galerita* (Konow) **comb. n.**
*Sciapteryx kozlovi* Konow (Tibet) = *Tenthredo kozlovi* (Konow) **comb. n.**
*Sciapteryx gilva* Konow (Tibet) = *Rhogogaster gilva* (Konow) **comb. n.**
*Sciapteryx virescens* Konow (Tibet) = *Rhogogaster virescens* (Konow) **comb. n.**

*Sciapteryx caucasica* Dovnar-Zapolskĭ (Caucasus) and *S. montana* Dovnar-Zapolskĭ (Caucasus) cannot be placed because they are based on inadequately described males and are excluded from the key below.

All the species of this genus have size 7–10 mm.

Key to Species Males and Females

1 Gena dull with dense surface sculpture between punctures or with punctures closer together than their diameters. ♀ hypopygium evenly or acutely emarginate each side of middle . . . . . . . . . 2

– Gena behind eyes, shining, with punctures obsolescent or more widely spaced than their diameters. ♀ hypopygium not emarginate each side of middle . 10

2 (1) Fore wings ± infuscate or milky and $Sc + R$ not longitudinally bicoloured. Inner hind tibial spur not longer than apical breadth of tibia and only 4–5 times as long as broad.
Hypopygium in ♀ slightly emarginate each side of middle . . . . 3

– Fore wings subhyaline and the fused *Sc* + *R* paler in front (*Sc*) than behind (*R*). Inner hind tibial spur longer than apical breadth of tibia and 7 or 8 times as long as broad . . . . . . . . . . . . . . 7

3 (2) *Sc* + *R* and also usually *C* in fore wing pale yellow or brown Wings milky or with the fore wings ± infuscate. Stigma pale with or without dark apex 4

– *Sc* + *R* and *C* in fore wing mainly black. Wings almost uniformly infuscate. Stigma pale with dark apex. Atlantic Europe and Mediterranean †***soror*** Konow

4 (3) Stigma of fore wing bicoloured with dark apex and pale base. *C* of fore wing pale as in *Sc* + *R*. Fore wings ± infuscate . . . . . . . 5

– Stigma pale without dark apex and *C* infuscate apically. Wings uniformly milky. E. Mediterranean . . . . . . . †***lactipennis*** Konow

5 (4) Tegula entirely yellowish white . . . . . . . . (*costalis*) 6

– Tegula with most of basal half black. E. Mediterranean . ***levantina*** André

6 (5) Inner orbits and lower half of outer orbits lined with white in ♂ and ♀; ♂ with face below antennae entirely white; ♀ with interantennal area pale marked Corsica . . . . . . . . †***costalis corcyrensis*** Benson

– Only the inner orbits above pale-lined in ♀ and interantennal area entirely black; in ♂ whole inner orbits and lower outer orbits pale-lined but clypeus ± marked with black. C. and E. Europe . . ***costalis costalis*** (Fab.)

7 (2) Darker species, flagellum of antenna and, even in ♂, base of clypeus, most of face between antennae and clypeus, mesopleura, ± stigma black. Abdomen without a continuous pale lateral band and with no entirely pale apical sternites. Antenna with flagellar segments all longer than broad . . 8

– Paler species, underside of flagellum, most of clypeus and face below antennae even in ♀, ± fleck on mesopleura, most of stigma, a broad lateral band on the abdomen and at least 1 or 2 entire apical sternites yellowish white. Antenna with 7th and 8th segments as broad as long (♂) or broader than long (♀). Head and thorax with aeneus reflections. E. Mediterranean †***laeta*** Konow

8 (7) Inner orbits in ♂ and ♀ pale-lined to top of eyes. Head and thorax often with cupreous or aeneus metallic reflections. Stigma yellowish white infuscate below or at apex . . . . . . . . . . . . . . 9

– Inner orbits in ♂ and ♀ at most only pale-lined on lower half, with a small fleck at top of eye. Head and thorax carbonarius or with slight bluish, purplish or greenish reflections. Stigma piceous. ♀ hypopygium slightly and evenly emarginate each side of middle. W. and C. Europe . ***consobrina*** Klug

9 (8) Stigma pale ± infuscate below. Labrum and ± base of clypeus pale. ♀ hypopygium sharply excised each side of middle (as in *laeta*). E. Mediterranean . . . . . . . . ***circassica*** Dovnar-Zapolski

– Stigma pale at base and infuscate at apex. Labrum and clypeus black except at most for a lateral pale fleck each side of clypeus. ♀ hypopygium evenly emarginate each side of middle (as in *consobrina*). S.E. Europe (Thrace) ***byzantina*** sp. n. (p. 188)

10 (1) Stigma bicoloured with infuscate apex or mainly infuscate . . . . 11

— Stigma mainly yellowish white . . . . . . . . . . . . 12

11 (10) Stigma bicoloured with infuscate apex. Veins *C* and *Sc* + *M* in fore wing entirely pale. Tegula black with narrow white apex. All legs black with a white line above or on outside. S.E. Mediterranean †***cleopatra*** Benson

— Stigma mainly infuscate. Only base of *C*, and *Sc* pale. Tegula black. Legs mainly black. Crimea . . . . . . . ***semenowi*** Jakovlev

12 (10) Tegula entirely yellowish white. Turkestan . . . ***nigriventris*** André[14]

— Tegula black with only the apex yellowish white. Turkestan ***hauseri*** Forsius

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[14] Synonym of *S. nigriventris*: *Sciapteryx costalis vernalis* Kuznetzov-Ugamskil, **syn. n.**

### †***Sciapteryx soror*** Konow

TURKEY, E.: Gumusane (11). 1 ♂, 1 ♀.

Elsewhere only in ATLANTIC and MEDITERRANEAN EUROPE (Britain, W. France, Switzerland, Spain and Italy). This species forms an Atlantic/Continental species pair with *S. costalis* F. (Benson, 1952).

### †***Sciapteryx lactipennis*** Konow

TRANSCASPIA, IRAN, TRANSCAUCASIA and ISRAEL.

### ***Sciapteryx levantina*** André

SYRIA and LEBANON.

### †***Sciapteryx laeta*** Konow

TURKEY, E.: Gumusane (11). 4 ♂. 8 ♀.
TURKEY and TRANSCAUCASIA.

### ****Sciapteryx circassica*** Dovnar-Zaposkiî

TURKEY, E.: Gumusane (11); Trabzon (3 and 17). 31 ♂, 28 ♀.

TURKEY and TRANSCAUCASIA.

### ***Sciapteryx cleopatra*** Benson, 1954

EGYPT and ISRAEL.

### ****Sciapteryx byzantina*** **sp. n.**

♀. *Black* with the following parts yellowish white: labial palps, inner orbits above level of antennae, hind edge of pronotum, front half of tegula, extreme apex of femora and ± outer edge of tibiae, ± base of basitarsus and apical margin of all tergites. Wings hyaline: basal half of stigma, extreme apex and base of costa and subcosta (front half of $Sc + R$) yellowish white; rest of venation piceous. Length 8–9 mm.

*Head* and *thorax* normal, dull with dense punctures closer together on gena than their diameters and the interspaces ± with fine surface sculpture. Antenna with all flagellar segments longer than broad. Inner hind tibial spur longer than apical width of tibia and about × 7 or × 8 times longer than its own basal width. *Abdomen* dull with dense transverse surface sculpture.

Hypopygium emarginate each side of middle saw. ♂ as in ♀ apart from sexual characters but that the clypeus has a small whitish fleck each side and the pale margin of the inner orbits reaches to bottom of eyes.

Holotype ♀. TURKEY, N.W.: Istanbul, Belgrat Orman, at sea level, 25.iii.62 (*Guichard & Harvey*). B.M. (N.H.).

Paratypes. Same data, 15 ♂, 1 ♀. TURKEY, N.E.: Rize at sea level, 1 ♀, 22.iv.1959 (*Guichard*). B.M. (N.H.).

## TENTHREDINAE

## MACROPHYINI

### *Pachyprotasis rapae* (L.)

TURKEY, N.E.: Giresun (7); Trabzon (3, 4, 15 and 17). 20 ♂, 20 ♀.

N. temperate HOLARCTIC species.

### *MACROPHYA* Dahlbohm

Two major sections of the genus are defined as species-groups in the present paper and keys are given for the species of these groups from EUROPE and S.W. ASIA.

### *Macrophya punctumalbum* (L.)

TURKEY, N. and C.: Amasya (6); Samsun (8). 10 ♀.

N. IRAN: Mazandaran, Panjak Rostaq, 860–900 m., 1 ♀, 29.iv.1967 (*D. B. Baker*).

### *Macrophya albicincta* (Schrank)

TURKEY, W., N. and N.E.: Bursa (3, 9); Bolu (1); Samsun (9, 15, etc.); Giresun (7); Trabzon (4, 7, 17); Rize (2). 36 ♂, 39 ♀.

EUROPE, to TRANSCAUCASIA, N. IRAN, W. SIBERIA.

### *Macrophya crassula* (Klug)

TURKEY, W., S., N., and N.E.: Bursa (3 and 9); Mersin (6 and 7); Sinop (1); Samsun (9, 10, 21, etc.); Trabzon (17, etc.); Artvin (2). 33 ♂, 39 ♀.

C. and S. EUROPE to TRANSCAUCASIA.

### *Macrophya consobrina* Mocsáry

TURKEY and TRANSCAUCASIA.

### *Macrophya pallidilabris* A. Costa

TURKEY, W. and N.E.: Bursa (4, 5 and 9); Gumusane-Trabzon (11). 6 ♂, 6 ♀.

C. EUROPE to TRANSCAUCASIA.

### *Macrophya erythrocnema* A. Costa

TURKEY, N.E.: Rize (8); Artvin (3). 2 ♀.

S. EUROPE to TRANSCAUCASIA.

### †*Macrophya rufipes orientalis* Moscáry

For nec *M. orientalis* Mocsáry; Benson, 1954 vide *M. diaphenia* sp. n.

TURKEY, C. and E.: Ankara (35); Gumusane (7). 3 ♀.

In this race the red markings on the middle tergites (3 and 4) are entirely absent. In N. Africa the species is represented by *M. rufipes ruficincta* Konow, **stat. n.,** which differs from the typical race in having a black clypeus and black hind tibia and tarsus in both sexes.

### ***Macrophya sanguinolenta*** (Gmelin)

Turkey, N.E. and E.: Trabzon (3); Rize (8); Erzurum (9). 2 ♂, 1 ♀.

Europe, Turkey and Transcaucasia.

### The *BLANDA-DUODECIMPUNCTATA*-group

Representatives of this species-group are recognized by the presence of a small appendage behind the metepisternum as a separate sclerite between the hind coxa and the 1st tergite.

In addition to the species from Europe and S.W. Asia keyed below, *M. apicalis* Smith (Japan), *M. ignava* Smith (Japan), *M. infumata* Rohwer (E. Siberia) as well as *M. fumator* Norton (N. America) belong to this group.

#### Key to Males and Females of Europe & S.W. Asia

1 Appendage to mesepisternum (between hind coxa and 1st tergite) always infuscate. Abdomen black with lateral or ventral white flecks. Either hind legs ± red, or hind tibia or tarsus white-flecked. Wings yellowsh or subhyaline . . . 2

– Appendage to mesepisternum often mainly white. Abdomen ± red-banded, without white flecks, or hind tibia and tarsus entirely black. Wings often ± infuscate . . . 4

2 (1) Hind legs not marked with red . . . 3

– Hind legs partly red . . . 7

3 (2) Wing membrane yellowish; stigma and venation yellowish brown. Hind tarsus black. Europe, Asia Minor, and Siberia to Japan **duodecimpunctata** (L.)

– Wing membrane subhyaline. Stigma and venation infuscate. Hind tarsus with apical segments white. Transcaucasia and Iran . **longitarsus** Konow

4 (3) Hind coxa with a white fleck laterally or beneath . . . 5

– Hind coxa entirely black. Europe, S.W. Asia to Iran and Siberia **annulata** (Geoffroy)

5 (4) ♂ with hind tarsus normal (4th segment much longer than broad in ventral view (Text-fig. 27). ♀ hypopygium only slightly emarginate apically each side . . . 6

– ♂ with hind tarsus swollen (4th segment scarcely longer than broad in ventral view) (Text-fig. 28). ♀ hypopygium excised apically each side of middle. C. Turkey . . . **oedipus** sp. n. (p. 194)

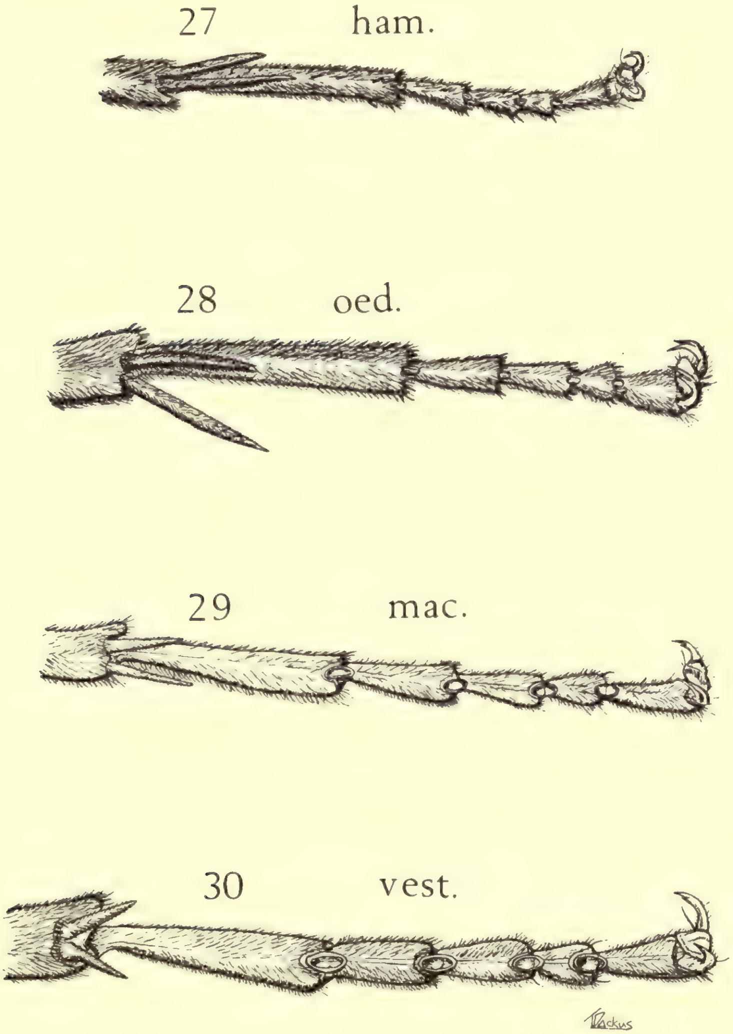
6 (5) ♂ abdomen mainly black with white flecks below. Pubescence on head and thorax up to as long as diameter of an ocellus. Penis-valve Text-fig. 33. (♀ unknown). Mountains of E. Turkey . . . **hamata** sp. n. (p. 194)

– ♂ abdomen ± red-banded and without white flecks below. Pubescence on head and thorax not longer than half diameter of an ocellus. Penis-valve as in Text-fig. 32. Europe, Asia Minor, to Iran and Siberia **blanda** (Fabricius)

7 (2) Metepisternum with lower two-thirds shining and without surface sculpture apart from hair follicles. Frons shining between punctures and without a continuous medial groove. Wings subhyaline. ♂ with pale yellow front and middle femora and tibia strongly contrasting with its hind legs and with the red front and middle legs of the ♀. Europe, Asia Minor to N. Iran . . . . . . . . . . . ***diversipes*** (Schrank)

– Metepisternum dull with dense surface sculpture all over. Frons dull with dense surface sculpture and with a deep medial groove reaching from front ocellus to interantennal area.

Wings uniformly slightly infuscate. ♂ with front and middle femora and middle tibia reddish as in the hind legs and as in the ♀. Iran ***diaphenia*** sp. n. (p. 195)

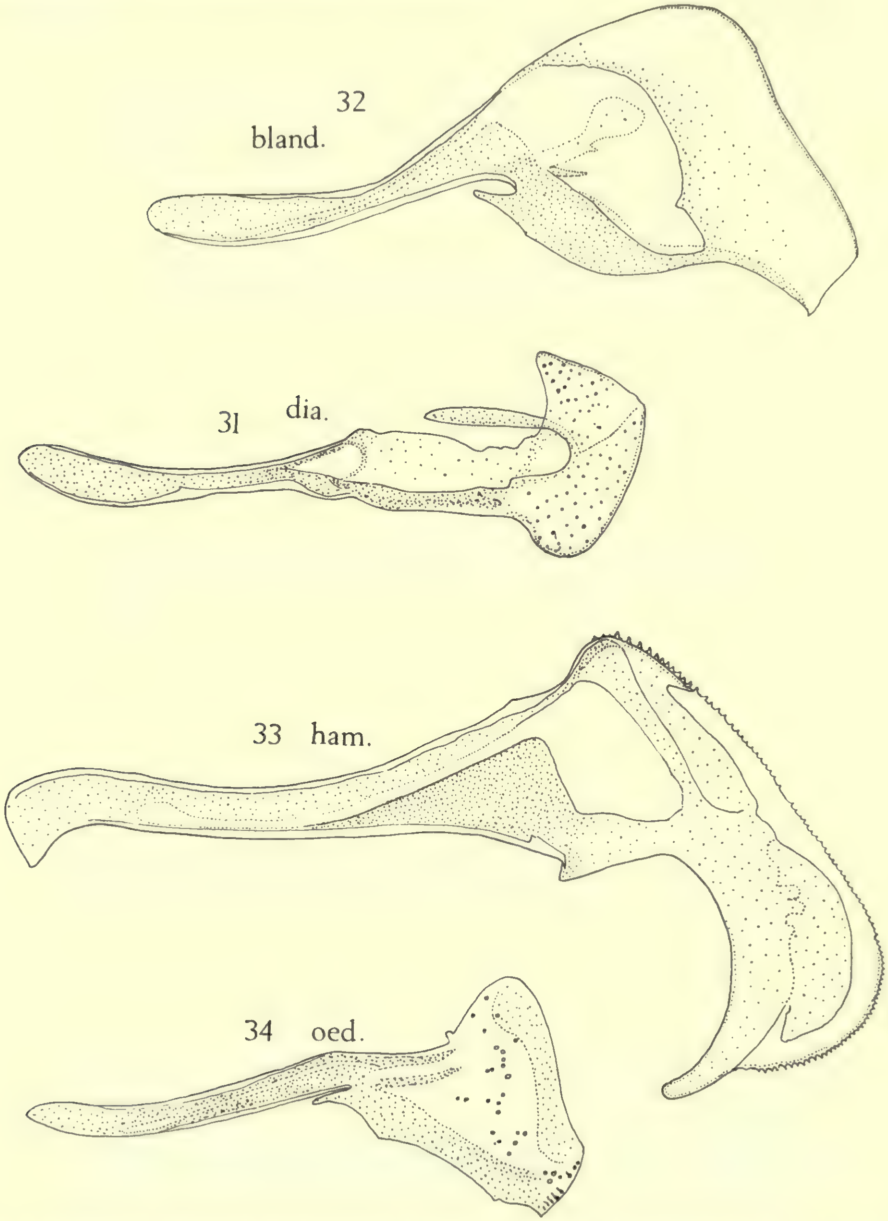


Figs. 27–30. ♂ hind tarsus: 27, *Macrophya hamata* sp. n.; 28, *M. oedipus* sp. n.; 29, *Tenthredo maculata*; and 30, *T. vestita*.

### *Macrophya duodecimpunctata* (L.)

Turkey, N.: Samsun (2 and 6).

Europe, Turkey and Siberia to Japan.


32
bland.
31
dia.
33
ham.
34
oed.

Figs. 31–34. *Macrophya* penis-valves in lateral view: 31, *diaphenia* sp. n.; 32, *blanda*; 33, *hamata* sp. n.; and 34, *oedipus* sp. n.

### ***Macrophya longitarsus*** Konow

IRAN: Mazandaran, Chalus–Shahsavar coast of Caspian Sea. v–vi.1966 (*D. B. Baker*).

TRANSCAUCASIA and IRAN.

### ***Macrophya annulata*** (Geoffroy)

TURKEY, C. and N.: Ankara (15); Samsun (9). 4 ♂, 2 ♀.

IRAN: Mazandaran, Chalus–Shahsavar coast of Caspian Sea, v.1966 (*D. B. Baker*).

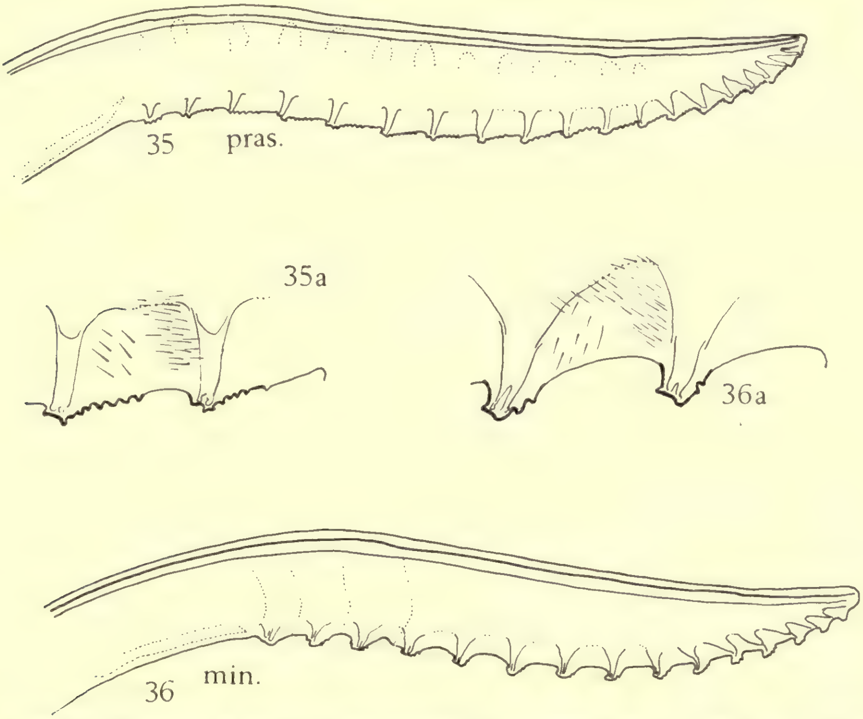
EUROPE, S.W. ASIA to IRAN and SIBERIA.

### ***Macrophya blanda*** (Fabricius)

TURKEY, W., S., C., N.E. and E.: Usak, Bulgaz Dag Mts., Kizilcahaman, 1,000 m., 1 ♂, 2 ♀, 26.v–16.vi.1965 (Demelt Coll., Gembloux); Mersin (6, 7 and 14); Ankara (31 and 39); Amasya (3, 7, 9 and 13); Konya (3); Samsun (10); Giresun (2); Trabzon (3 and 15); Artvin (3); Erzurum (5, 6). 18 ♂, 48 ♀.

IRAN: Mazandaran, Chalus–Shahsavar Coast of Caspian Sea, v.1966 (*D. B. Baker*).

EUROPE, TURKEY, TRANSCAUCASIA, IRAN and SIBERIA.



FIGS. 35–36. *Macrophya* saws: 35, *prasinipes*; 36, *minerva* sp. n. 35a–36a. Enlarged 10th and 11th teeth from apex of saws: 35a, *prasinipes*; 36a, *minerva* sp. n.

### ***Macrophya oedipus* sp. n.**

(Text-figs, 28, 34)

♂. Black with tergites 3 and 4 and sometimes also 5, 6 and 7 ± red laterally and the following parts white: labrum, ± front of clypeus, posterior extra sclerite on metepisternum; front face of all coxae and ± lateral fleck on hind coxae, front face of fore and middle femora and tibiae, front tarsus, most of middle tarsus (except line on back of basitarsus, and the claw-bearing segment) and lower edge of hind femur. Wings hyaline; stigma and venation black.

*Length* 9–11 mm.

*Head* with mouthparts normal; malar space about one-fourth of distance between antennal sockets; 3rd antennal segment about as long as 7 + 8 + 9; frontal area not clearly defined; frontal groove running from front ocellus to interantennal area; hind ocelli closer together than from hind margin of head as 1·0 : 1·4; and from eye margin as 1·0 : 2·3.

*Thorax* with rounded convex mesoscutellum, medially carinate over posterior half and with minute extra appendage attached to posterior margin of metepisternum, which is dull medially with dense surface sculpture. Legs with swollen hind tarsus so that the 3rd tarsal segment in ventral view is almost as broad as long (Text-fig. 28). Claws bifid with the inner tooth longer and stouter than the end tooth. *Abdomen* normal with penis-valve as in Text-fig. 34.

*Punctation:* Head very densely and coarsely punctured on the frontal area and though the punctures are sparse on the temples, the surface between the punctures is dull with dense coriaceous sculpture. On the thorax the punctures are smaller and more evenly spaced but the interspaces are likewise dull with dense coriaceous sculpture. Abdomen dull with dense transverse alutaceous sculpture.

*Pubescence* clothing whole of insect very short, nowhere exceeding about half diameter of an ocellus.

♀ as ♂ in colour but labrum and clypeus ± infuscate, the front half of the mesoscutellum is white, the legs are black except for white as follows: a fleck on the underside of the fore and middle coxae and the side of the hind coxae, a line on the front of the fore femur, tibia and basitarsus and ± on the apex of the middle femur. In structure as ♂ except for sexual segments; hypopygium emarginate behind each side of middle. Length 12–13 mm.

Holotype ♂. TURKEY, C.: Amasya, 500 m., 31.v.1959 (*K. M. Guichard*). B.M. (N.H.).

Paratypes. TURKEY, C.: Amasya, 500 m., 5 ♂, 1 ♀, 22–24.v.1959, 2 ♂, 2 ♀, 29.v.1959, 4 ♂, 1–2.vi.1959, 1 ♀, 6.vi.1959, 2 ♂, 1 ♀, 9.vi.1959, and 400 m., 6 ♂, 4 ♀, 30.v.1959 (*K. M. Guichard*). B.M. (N.H.).

### ***Macrophya hamata* sp. n.**

(Text-figs. 27, 33)

♂. Colour as in *M. oedipus* but that the clypeus is black except for its front margin, the fore and middle femora and tibiae are only lined with white in front, the hind coxae, though white-flecked below, have no lateral white fleck, the abdomen has the red reduced to at most a lateral fleck each side of the 2nd tergite, but has a white fleck on the hind lateral corners of each of the 3rd to 6th tergites, and white apical margins to the sternites. The pubescence is much longer than in *M. oedipus*, *blanda* and *annulata*; on head, mesonotum and mesopleura the hairs are up to as long as the diameter of an ocellus. Penis-valve as in Text-fig. 33. Otherwise as in *M. blanda*. ♀ unknown.

Holotype ♂. TURKEY: Artvin, above Artvin, 1,800 m., 6.vi.1962 (*K. M. Guichard & D. Harvey*). B.M. (N.H.).

Paratypes. 1 ♂ (same data), 1 ♂ (likewise but at 900 m.) and 1 ♂, TURKEY: Trabzon, Hamsikoy, 1,245 m., 22.v.1962 (*Guichard & Harvey*). B.M. (N.H.).

### ***Macrophya diversipes*** Schrank

TURKEY, W., C., N.E. and E.: Mugla (8); Mersin (8); Ankara (9, 37 and 39); Corum (2); Amasya (1, 2, 3, 5 and 7); Artvin (2 and 6); Gumusane (1 and 10); Erzurum (1, 4, 5, 8, 10 and 11). 26 ♂, 41 ♀.

C. and S.E. EUROPE, TURKEY, TRANSCAUCASIA and N. IRAN.

### ***Macrophya diaphenia*** **sp. n.**

(Text-fig. 31)

*Macrophya orientalis* Mocsáry; Benson, 1954, *nec* Mocsáry.

♂. Black with the following parts yellowish white: labrum, front half of clypeus, fore tibia and tarsus, apex and inner side of middle tibia, and middle tarsus (except apical segment); trochanters brown; red are the fore femur, middle femur and basal outer side of middle tibia, hind femur and tibia (except its extreme apex). Length 11–12 mm.

Wings brownish-infuscate, paler towards base. Basal half of stigma and basal three-fourths of costa brown; rest of venation black.

*Head* contracted behind eyes. Malar space one-third as long as distance between antenna or diameter of front ocellus. Antenna with 3rd segment about as long as 4th and 5th. Frons with a deep medial groove reaching from front ocellus to interantennal area. Hind ocelli closer together than from hind margin of head as 1·0 : 1·7, and from eye margin as 1·0 : 2·0.

*Thorax* with slightly convex mesoscutellum, carinate medially for posterior half; metepisternum dull medially with dense surface sculpture and with a small posterior appendage.

*Legs* with hind tarsus swollen so that the 4th segment in ventral view is almost as long as broad.

*Abdomen* normal. ♂ penis (Text-fig. 31) not distinguished from that of *M. diversipes.*

*Punctation* dense on head and thorax; interspaces shining on head, but on mesonotum and mesopleura the interspaces are dull with dense surface sculpture.

*Pubescence* dense all over insect and very short so that nowhere on head and mesonotum are the individual hairs as long as the diameter of an ocellus.

♀ as ♂ but the stigma of the fore wing is entirely yellowish brown and all the legs have the femur and tibia red and the trochanters and tarsus infuscate, and the hind tarsal segments are not so swollen, the 4th being × 1½ as long as wide in ventral view. Hypopygium slightly emarginate each side of middle. Saw not distinguished from that of *M. diversipes.*

Holotype. ♂. S.W. IRAN: Kuh Sefid, nr. Bazuft, (*Escalera Coll.*). B.M. (N.H.).

Paratypes. Same data, 3 ♂, 2 ♀; N. IRAN: Elburz Mountains, Mt. Demavend, 2,800 m., 1 ♀, vii.1966 (*L. G. Higgins*). B.M. (N.H.).

### The *POSTICA*-group

Species with eyes converging in front and abdomen with at least a white band on the 1st tergite and lateral flecks on some of the others; at least front and middle legs. hind coxa and base of hind femora mainly yellow or orange.

### KEY TO MALES AND FEMALES

1 *Either* mesonotum entirely dull with surface sculpture between fine punctures and front lobe usually with dark adpressed pubescence shorter than diameter of front ocellus *or* hind legs with tibia and tarsus mainly black. (♀ hypopygium strongly emarginate) . . . . . . . . . . . 2

– Mesonotum with the interspaces between the punctures shining and the pubescence on the front lobes pale, and usually outstanding and longer than diameter of front ocellus; hind legs with tibia mainly yellow or orange . . 6

2 (1) Stigma of fore wing and hind tibia and tarsus mainly orange or yellow (except in ♂ *aphrodite*). Pubescence short, dark and adpressed on front lobe of mesonotum . . . . . . . . . . . . . . 3

– Stigma of fore wing and hind legs mainly black (subsp. *arpaklena* Ushinskiĭ, from TURKESTAN and N. IRAN has ♀ hind tarsus with segments 2–4 white as in ♂, and abdomen with pale flecks reduced). EUROPE, N. AFRICA, ASIA MINOR to TURKESTAN . . . . . . . . . ***montana*** (Scopoli)

3 (2) Head above dull with dense surface sculpture between punctures. Post-tergite of scutellum longer medially than a cencher . . . . . . . . 4

– Head above shining between punctures, which are very sparse and obsolescent on middle of temples. ASIA MINOR to S.W. IRAN . . . . †***cyrus*** Benson

4 (3) Costa of fore wing infuscate, darker than the yellow stigma. Scutellum with depressed posterior third dull with dense sculpture and with anterior two-thirds shining between sparse punctures . . . . . . . . 5

– Costa of fore wing coloured the same as the yellow stigma. Scutellum with the posterior half dull with dense sculpture and the anterior half shining between scattered punctures. LEBANON, ISRAEL, TRANSCAUCASIA and IRAN ***ottomana*** Mocsáry

5 (4) Temples between postocellar region and eyes dull, with surface sculpture between the dense punctures: ♂ hind tibia mainly orange and brown. C. and S.E. EUROPE and TURKEY . . . . . . . . . ***postica*** (Brullé)

– Temples between postocellar region and eyes with shining interspaces between scattered punctures; ♂ hind tibia mainly black. CYPRUS . †***aphrodite*** Benson

6 (1) Stigma of fore wing darker apically than basally. Hind tarsus black. ♀ hypopygium not emarginate each side . . . . . . . . . 7

– Stigma of fore wing unicolorous brown. Hind tarsus reddish brown. ♀ hypopygium strongly emarginate behind each side of middle. S.E. EUROPE and TURKEY . . . . . . . . . . ***superba*** Tischbein

7 (6) Abdominal segments of ♀ ringed with pale apical margins to tergites and sternites; ♂ abdomen yellow above, except for the bases of the tergites medially, and entirely yellow laterally and ventrally. Saw with shallow teeth (Text-fig. 35 and 35a). TRANSCAUCASIA . . . . . . ***prasinipes*** Konow

- Abdomen in ♀ black except for the yellow apical margins of the tergites medially; (♂ unknown). Saw with prominent teeth (Text-figs. 36 and 36a). GREECE ***minerva*** sp. n. (p. 197)

## ***Macrophya montana montana*** (Scopoli)

TURKEY: Amasya (2, 5 and 7); Samsun (10); Sivas (3); Rize (8). 12 ♂, 14 ♀. (Ssp. *arpaklena* Ushinskij in TURKESTAN and N. IRAN, Mazandaran on the Caspian Sea Coast, iv–v.1965–1966 (*D. B. Baker*)).

EUROPE, N. AFRICA, TURKEY, TRANSCAUCASIA, IRAN and TURKESTAN.

### *†***Macrophya cyrus** Benson, 1954

TURKEY, C. and E.: Amasya (1, 2, 3 and 7); Nigde (4); Gumusane (13); Erzurum (1, 4, 5, 6 and 8). 51 ♂, 49 ♀.

TURKEY and S.W. IRAN.

### ***Macrophya ottomana*** Mocsáry

LEBANON, ISRAEL, TRANSCAUCASIA and IRAN.

### ***Macrophya postica*** (Brullé)

TURKEY, S.W., S.C., N., N.E. and E.: Aydin (1 and 2); Mugla (2, 5 and 7); Antalya (5 and 89); Mersin (1, 2 and 4); Ankara (12); Amasya (1, 2, 5, 7 and 14); Sinop (3 and 4); Samsun (10); Artvin (6); Gumusane (13); Erzurum (4). Many ♂ and ♀.

### †***Macrophya aphrodite*** Benson, 1954

CYPRUS.

### ***Macrophya superba*** Tischbein

TURKEY, N., C., N.E. and E.: Izmit, Alem Dag, 600 m., 1 ♀, 26–30.vi.1966 (Demelt Coll. Gembloux); Ankara (21, 35 and 39); Cankiri, Isik Dag, 1,200 m., 2 ♀, 25.vi.1966 (Demelt Coll. Gembloux); Amasya (1, 2, 3 and 7); Nigde (5); Artvin (2) Gumusane (1); Erzurum (4). 35 ♂, 42 ♀.

S.E. EUROPE and TURKEY.

### ***Macrophya prasinipes*** Konow

TRANSCAUCASIA.

### ***Macrophya minerva* sp. n.**

(Text-figs. 36, 36a)

♀. *Black* with the following parts yellowish white: palps of mouthparts, labrum, clypeus, hind margin of pronotum, tegula (except at base), apices of coxae, trochanter, upper outer face of hind coxa, femora (except small inner basal fleck) and tibiae of all legs (except apex of hind pair) and fore and middle tarsus (except for broken black line on inner side), apical margin of 1st tergite and lateral dorsal margin of 3rd and following tergites.

*Wings* subhyaline; base of stigma, base of *C*, and *Sc* (front half of *Sc* + *R*); rest of venation piceous becoming paler at extreme base. Length: 11 mm.

*Head* normal, slightly contracted behind eyes. Malar space about as long as 2 facets of compound eye. Flagellar segments of antenna all longer than broad. Occipital carina complete. Posterior ocelli about as far apart as from occipital carina (POL = OOCL); and closer together than from nearest compound eye margin (POL: OOL = 1·0 : 1·5).

*Thorax* normal, without the extra metepisternal sclerite between the hind coxa and 1st tergite. Mesoscutellum slightly convex.

Abdomen normal; hypopygium only slightly emarginate each side. Saw (Tet-xfigs. 36 and 36a).

*Punctation.* Head shining with dense punctures on frons, inner orbits and postocellar region but becoming obsolescent on temples and finer and denser on outer orbits. Thorax shining between punctures ± as far apart as their diameters, though more widely spaced on the middle of the mesoscutellum and much denser on the underthorax. Abdomen densely alutaceous transversely.

*Pubescence* on head and thorax dense and pale and up to about as long as twice the diameter of a hind ocellus; on abdomen about half this length and pale and dense and recumbent.

Holotype ♀. GREECE: Soufli, 1 ♀, 5.v.1960 (*Guichard & Harvey*). B.M. (N.H.). Distinguished from other members of the *postica*-group in the key above.

## NEMATINAE

### CLADIINI

**Cladius pectinicornis** (Geoffroy)

TURKEY, N. and C.: Samsun (6 and 21); Amasya (2, 3 and 5); Tokat (4). 4 ♂, 4 ♀.

EUROPE, N. AFRICA, SIBERIA to JAPAN, TRANSCAUCASIA, N. IRAN and HIMALAYAS.

**Cladius ordubadensis** Konow

GREECE: Samothrace, Therme, 3 ♂, 1 ♀, 16.viii.1962 (*Guichard & Harvey*).

CRIMEA, CYPRUS, LEBANON and TRANSCAUCASIA.

**Priophorus morio** Lepeletier

EUROPE, TRANSCAUCASIA, IRAN, SIBERIA, to JAPAN and N. AMERICA.

**Priophorus pallipes** Lepeletier

EUROPE, TRANSCAUCASIA, SIBERIA to JAPAN and N. AMERICA.

**Priophorus rufipes** Lepeletier

*Priophorus ulmi* (L.) Konow, nec L.

EUROPE, TURKEY, TRANSCAUCASIA.

**Trichiocampus viminalis** (Fallén)

EUROPE, TRANSCAUCASIA, SIBERIA to JAPAN and N. AMERICA.

### PSEUDODINEURINI

**Pseudodineura fuscula** (Klug)

EUROPE, TRANSCAUCASIA and SIBERIA.

## HOPLOCAMPINI

### *HOPLOCAMPA* Hartig

The species of this genus segregate naturally into 3 distinct groups, all feeding as larvae in the fruits of Rosaceae: two groups attached to the Prunoidea and one to the Pomoidea. Unfortunately the major group characters, the shape of the clypeus, the direction of the inner eye-margins and the pubescent clothing of the under-thorax, have not been mentioned in previous descriptions, and it is not therefore always possible to place species I have not examined.

### Key to Species-groups

1 Clypeus broadly and shallowly emarginate in front to a depth less than half total length of clypeus, or (i.e. *flava*) mesepisternum densely pubescent all over and eyes large so that they are closer together in front than 1¼ times their own greatest length. Attached to *Prunus* (Prunoidea) . . . 2

– Clypeus deeply excised in front to a depth of at least half the total clypeal length. Lower mesepisternum and mesosternum at least partly glabrous (with areas devoid of hair follicles). Eyes always further apart in front than 1¼ times their length. Attached to Pomoidea : Eurasian species : *alpina* Zetterstedt (*Sorbus*); *aviae* Benson (*Sorbus*); *brevis* Klug (*Pyrus*); *crataegi* Klug (*Crataegus*); *ephippiata* Konow (*Malus*), *pectoralis* Thomson (*Crataegus*); *plagiata* Klug (*Amelanchier*); *pyricola* Rohwer (*Pyrus*); ? *sino-birmana* Malais; *testudinea* Klug (*Malus*) (Text-fig. 39).

Nearctic species (apart from introductions): *alpestris* Rohwer (*Amelanchier*); *bioculata* Rohwer (*Amelanchier*); *halcyon* Norton (*Amelanchier*); *montanicola* Rohwer (*Amelanchier*); *oskina* Ross (*Crataegus*); *pallipes* Macgillivray (*Amelanchier*); *ritcheri* Ross (*Crataegus*); and *texas* Ross (*Crataegus*) ***testudinea*-group**

2 (1) Eyes strongly diverging in front (where they are further apart than 1½ times their length). Mesepisternum below and mesosternum mainly glabrous. Nearctic species: *idaho* Ross; *lacteipennis* Rohwer (Text-fig. 38); *marlatti* Rohwer; *nalema* Ross; ? Ashmead . . . . . . ***oregonensis*-group**

– Eyes subparallel in front (where they are closer together than 1½ times their length). Mesepisternum and mesosternum densely pubescent.

Eurasian species: *chrysorrhoea* Klug; *flava* L.; ? *formosana* Malaise; *minuta* Klug; *prunicola* sp. n.; *rutilicornis* Klug (Text-fig. 37).

Nearctic species: *cookei* Clarke; *oskima* Ross . . . . ***flava*-group**

### ***Hoplocampa testudinea*** (Klug)

Europe, Turkey and Transcaucasia.

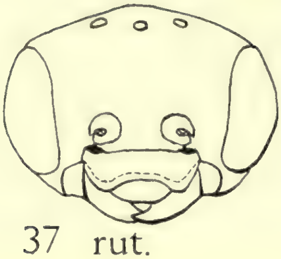
### ***Hoplocampa brevis*** (Klug)

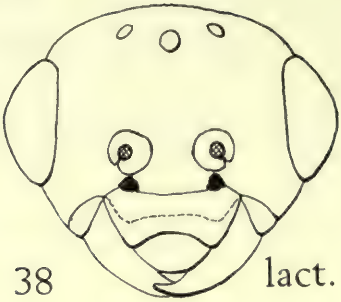
Europe and Transcaucasia.

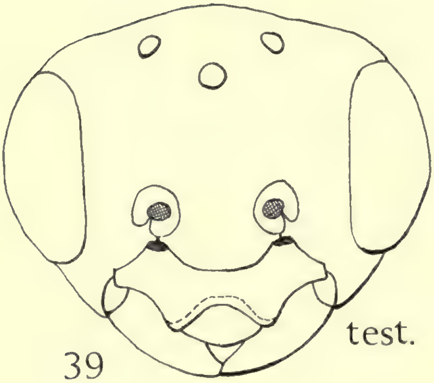
### ****Hoplocampa crataegi*** (Klug)

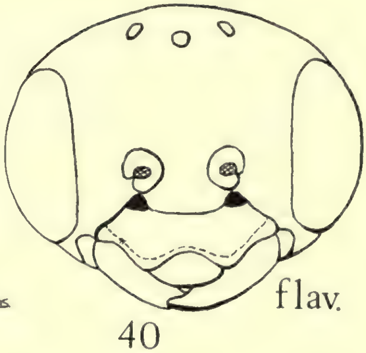
Turkey, W.: Bursa (1 and 3). 8 ♂, 9 ♀ from *Crataegus* blossom.

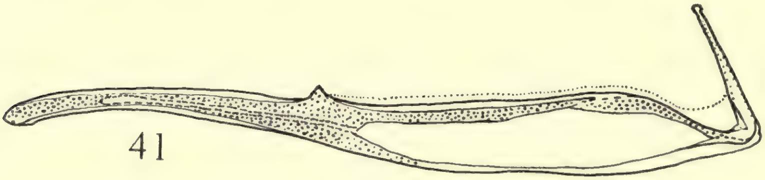
A very dark form in which in the ♀ the antenna, postocellar region and occiput

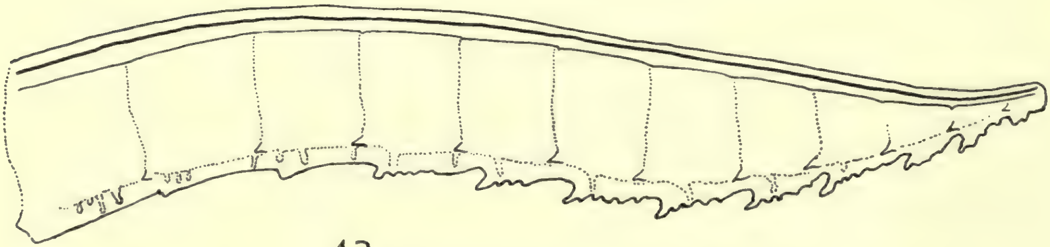












FIGS. 37–42. 37–40. *Hoplocampa* faces: 37, *rutilicornis*; 38, *lacteipennis*; 39, *testudinea*; and 40, *flava*. 41–42. *Hoplocampa prunicola* sp. n.: 41, penis-valve; and 42, saw.

of head, almost the entire mesonotum and the hind tibia are black and the stigma of the fore wing is slightly infuscate basally.

C. and S. EUROPE and TURKEY.

### ***Hoplocampa pectoralis*** Thomson

N. IRAN: Mazandaran, Pankaj Rostaq, 1 ♀, 29.iv.1967 (*D. B. Baker*).

EUROPE, TRANSCAUCASIA and N. IRAN.

### ***Hoplocampa flava*** (L.)

TURKEY, S.: Antalya (11). 1 ♂ at flowers of *Prunus insititia* L.

EUROPE, ISRAEL, TURKEY and TRANSCAUCASIA.

### ****Hoplocampa prunicola* sp. n.**

(Text-figs. 41, 42)

♀. Reddish yellow with the following parts black or piceous: ocellar region, front edge and hind margin of pronotum, middle line of front mesonotal lobe, most of lateral mesonotal lobes, middle line and hind edge of scutellum and its post-tergite, mesepimeron and metepimeron above, sclerotised parts of 1st–3rd tergites, and following tergites above. Wings hyaline; stigma and venation very pale brown. Length 4 mm.

*Head* with clypeus evenly emarginate in front to depth of about one-third of its total length. Eyes subparallel in front and closer than 1½ times their own greatest measure apart in front (1·4 : 1·0). Hind ocelli further apart than from hind margin of head as 1·0 : 0·6, and from eye margin as 1·0 : 0·8 (= POL : OOL).

*Thorax* normal but with medial suture of front mesonotal lobes obsolescent.

*Abdomen* with hypopygium but slightly emarginate each side and ovipositor scarcely as long as hind-femur, without 2nd trochanter, and much shorter than hind tibia. Saw as in Text-fig. 42. *Pubescence* pale and evenly spread over head and thorax, much shorter than diameter of front ocellus.

*Punctation:* surface of head and thorax shining between shallow follicles; abdomen shining with faint alutaceous surface sculpture.

♂ as ♀ but with black more extensive to cover ± postocellar region and edges of frontal area and occiput of head, the whole of the thorax except the pronotum and tegula, and the whole of the abdomen except the hypopygium; penis-valve as in Text-fig. 41.

Holotype ♀. TURKEY: Izmit, Karamursel, 1 ♀, 23.iii.1961 on *Prunus* (*H. Birkadesler*). B.M. (N.H.).

Paratypes. Same data, 3 ♂, 2 ♀. B.M. (N.H.).

This species is very closely related to *H. chrysorrhoea* Klug, from which it is distinguished by the almost entirely yellow head in the female and beaked penis-valve in the male (c.f. Text-fig. 41 with Benson, 1958, fig. 398 etc.); in the form of its penis-valve it would appear more to resemble *H. minuta* Klug.

The type of the Siberian species, *H. ephippiata* Konow (♂), was borrowed for comparison but this species was found to be scarcely separable structurally, including the penis-valve, from *H. pectorialis* Thomson.

## DINEURINI

### ***Caulocampus necopinus*** Zhelochovtsev

TRANSCAUCASIA.

## NEMATINI

### ****Stauronematus compressicornis*** (Fabricius)

TURKEY, C., N.E. and E.: Corum (2); Amasya (13); Rize (1); Trabzon (6 and 9); Gumusane (2). 4 ♂, 3 ♀.

HOLARCTIC species.

### ***Pristiphora abbreviata*** (Hartig)

CYPRUS: Pera Pedi, 700 m., 1 ♀, 4.iv.1952 (*G. A. Mavromoustakis*).
C. and S. EUROPE and TRANSCAUCASIA, introduced into N. AMERICA.

### ***Pristiphora subbifida*** (C. G. Thomson)

TURKEY, N.: Samsun, 1 ♀, 20.vii.1959 (*Guichard*).

EUROPE and TURKEY.

### ***Pristiphora conjugata*** (Dahlbom)

TURKEY, C.: Kula, 2 ♀, vi.1952 (Plant. Protection Institute), " Larva on poplar".

EUROPE, ASIA MINOR, SIBERIA to JAPAN.

### ***Pristiphora fulvipes*** (Fallén)

TURKEY, N. and N.E.: Samsun (8); Trabzon (4). 2 ♀.

EUROPE, ASIA MINOR, TRANSCAUCASIA and SIBERIA.

### ***Pristiphora*** sp. near ***fulvipes***

TURKEY: Trabzon (12).

### ***Pristiphora crassicornis*** (Hartig)

TURKEY: Zonguldak (1); Artvin (3). 2 ♂.

EUROPE and TURKEY.

### ****Pristiphora rufipes*** Lepeletier

TURKEY: Tokat (1). 1 ♀.

HOLARCTIC.

### **Pristiphora ambigua* (Fallén)

TURKEY: Giresun (7). 2 ♂, 20 ♀.
N. and C. EUROPE and ASIA MINOR.

### **Amauronematus sternalis* Enslin

TURKEY, C.: Ankara (13) (Beynam Forest, 1,000 m.). 2 ♀.
EUROPE, TURKEY and SIBERIA.

### **Nematinus luteus* (Panzer)

TURKEY, C. and N.E.: Tokat (3); Rize (3). 1 ♂, 2 ♀.
EUROPE and TURKEY.

### *Euura mucronata* (Hartig)

EUROPE, TRANSCAUCASIA, SIBERIA, HIMALAYAS and N. AMERICA.

### **Phyllocolpa puella* (C. G. Thomson)

TURKEY, N.E.: Giresun (2). 1 ♀.
EUROPE and TURKEY.

### *Phyllocolpa leucosticta* (Hartig)

TURKEY, E.: Gumusane (Soganli Gecidi at 1,800 m.). 2 ♂, 3 ♀.
EUROPE, TURKEY, TRANSCAUCASIA and SIBERIA.

### *Pontania vesicator* (Bremi-Wolf)

EUROPE and TRANSCAUCASIA.

### *Pontania bridgmanii* (Cameron)

EUROPE and TRANSCAUCASIA.

### *Pontania viminalis* (L.)

EUROPE and TURKEY.

### *Pontania dolichura* (C. G. Thomson)

Subarctic–Subalpine EUROPE, TRANSCAUCASIA, SIBERIA, N. AMERICA.

### *Croesus septentrionalis* (L.)

TURKEY, N.E.: Trabzon (14). 1 ♀.
EUROPE and TURKEY.

### ****Croesus varus*** (Villaret)

TURKEY, N.E.: Rize (1). 2 ♀.

HOLARCTIC.

### ****Nematus lucidus*** (Panzer)

TURKEY, N.E.: Artvin (3). 1 ♂.

EUROPE, CYPRUS and TURKEY.

### ***Nematus salicis*** (L.)

EUROPE and TRANSCAUCASIA.

### ***Nematus ribesii*** Scopoli

EUROPE and TRANSCAUCASIA, introduced into N. AMERICA.

### ***Nematus myosotidis*** (Fallén)

TURKEY, C., N., N.E. and E.: Amasya (13); Samsun (6 and 11); Giresun (7); Trabzon (7, 9, 15 and 16); Gumusane (3). 7 ♂, 9 ♀.

EUROPE, ASIA MINOR, W. SIBERIA.

### ****Nematus oligospilus*** (Förster)

TURKEY, C. and N.E.: Ankara (32); Trabzon (9); Rize (1). 1 ♂, 2 ♀.

HOLARCTIC to HIMALAYAS.

### ****Nematus viridis*** (Stephens)

TURKEY (N.E.): Trabzon (14 and 15); Rize (5). 1 ♂, 2 ♀.

EUROPE and ASIA MINOR.

### ***Pachynematus rumicis*** (L.)

EUROPE, IRELAND, TRANSCAUCASIA, SIBERIA and ALASKA.

### ****Pachynematus obductus*** (Hartig)

TURKEY, N.E.: Trabzon (18). 1 ♀.

HOLARCTIC species reaching ICELAND and GREENLAND.

### ***Pachynematus vagus*** (Fabricius)

TURKEY, C. and N.E.: Tokat (1); Trabzon (4). 2 ♀.

HOLARCTIC species.

### ****Pachynematus ? clitellatus*** (Lepeletier)

TURKEY (E.): Erzurum, Cakmak mountains, 2,200 m., 1 ♀, 24.v.1960 (*E. S. Brown*).

EUROPE and ASIA MINOR.

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# A LIST OF SUPPLEMENTS
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# THE SUBGENERIC DIVISIONS OF THE GENUS *BOMBUS* LATREILLE (HYMENOPTERA : APIDAE)

O. W. RICHARDS

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 22 No. 5
LONDON : 1968

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BY

O. W. RICHARDS

Imperial College of Science and Technology, London

*Pp.* 209–276, 39 *Text-figs.*

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# THE SUBGENERIC DIVISION OF THE GENUS *BOMBUS* LATREILLE (HYMENOPTERA : APIDAE)

*By* O. W. RICHARDS

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## SYNOPSIS

The described subgenera of *Bombus* Latreille are revised and listed and their characters discussed ; thirty-five subgenera are recognized as valid. Full synonymy is given and keys to males and females only are provided.

The current system of named subgenera for the large genus *Bombus* Latreille was first started by Vogt (1911) and Skorikov (1914, 1922). Originally, the subgenera were merely groups whose males possessed more or less closely similar genitalia and the names proposed for them were derived from the specific name of one of the included species. The system has gradually been elaborated and more names have been added; some of the old ones have tended to drop out because earlier names of von Dalla Torre (1880) were found to be available. Very few attempts have been made to provide a key to the sub-genera, many of which have never been described in detail. The females have been even more neglected than the males and though all sorts of characters have been indicated in the very scattered literature as helpful in recognizing the females of certain groups, no systematic account of the subgeneric classification of this sex is available. Some features of the European species were indicated by Krüger (1917, 1920) and Pittioni (1939a) even gave a key of a somewhat artificial type to the East European subgenera. Neither of these authors, however, referred to the important characters which can be found in the sting. Some of these had been noted by Richards (1927) and the North American species have recently been fully illustrated by Hazeltine & Chandler (1964). There is clearly a need for proper descriptions of the subgenera and for a key to them which includes all of them and not merely those of a small region.

Meanwhile, Milliron (1961) produced a new classification of *Bombus* which he divided into three genera, two each with two subgenera. He recognized no other subgenera though he mentions a number of " species groups ". I find Milliron's system unsatisfactory partly for fundamental reasons, partly because there are a number of errors in detail ; some of these may be misprints but others are incomprehensible.

The key to the genera and subgenera (pp. 54–55) depends largely on venational characters, which prove to be quite unworkable in a number of species on which they have been tested. Moreover, two of his genera, *Pyrobombus* von Dalla Torre and *Megabombus* von Dalla Torre, each fall in two halves of his key, so that their reintegration is essentially arbitrary. A number of exceptions have to be made for particular species suggesting that perhaps his genera would really be better split. Other points, more of detail, in Milliron's system which are very difficult to defend include, (1) putting *Obertobombus* Reinig in *Pyrobombus* sgen. *Pyrobombus* von Dalla Torre while *Sibiricobombus* Vogt (of which it is a synonym) is put in *Pyrobombus* sgen. *Cullumanobombus* Vogt, (2) putting *Thoracobombus* von Dalla Torre in *Pyrobombus* and not near its close allies in *Megabombus* von Dalla Torre, (3) separating *B. dentatus* Handlirsch and its subspecies *orichalceus* Friese from *Alpigenobombus* Skorikov (to which they clearly belong) and placing them in *Bombias* Robertson, with which they have little in common and further in putting with them *B. haueri* Handlirsch, which is really a member of *Crotchiibombus* Franklin which he places in *Pyrobombus* von Dalla Torre, (4) placing *Kallobombus* von Dalla Torre, *Alpinobombus* Skorikov and *Orientalibombus* Richards in *Megabombus* von Dalla Torre all the other groups of which have spinose mid basitarsi in the female.

Medler (1962a, 1962b) has made a number of studies of the wings and mouthparts of humblebees, measuring in particular the length of the marginal cell, the length of the glossa and the ratio of the length of the first segment of the labial palp to the length of the prementum (= labial index). He suggests (1962a : 217) that the group of species allied to *B. pratorum* (Linnaeus) (subgenus *Pyrobombus* von Dalla Torre) is an unnatural one because of discrepancies in the value of these indices. While it has long been known that the very large subgenus *Pyrobombus* includes species with a considerable range of structure I cannot agree that the group is unnatural. The subgenera are really defined on a number of characters of both sexes though the male genitalia are often the simplest means of reaching a quick identification. Indices are often very valuable for distinguishing species but must be used with care as indicators of relationships. The palps and mouthparts are almost certainly liable to rapid adaptation and may well be imperfect indicators of phylogenetic relationships.

The classification of *Bombus* has never been very closely set out but most specialists in the taxonomy of the genus are reasonably satisfied with something approaching the schemes of Vogt & Skorikov. The scheme set out below is far from original and cannot be regarded as final. Although the author is responsible for any errors, he is very grateful for much help and advice from Drs J. F. Perkins, B. Tkalců and I. H. H. Yarrow.

Alphabetical list of names available for the subgenera of *Bombus*.

Numbers are attached to the valid groups or to groups later described, and show the order in which they are dealt with in the descriptions.

30. ***ADVENTORIBOMBUS*** Skorikov, 1922 : 150.

Proposed as subgenus of *Agrobombus* Vogt. Type-species *Agrabombus* [*sic*] *adventor* Skorikov, 1914 = *Bombus adventor* (Skorikov, 1914), by designation of Sandhouse, 1943 : 522. (p. 254).

*AGROBOMBUS* Vogt, 1911 : 52.
Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus agrorum* (Fabricius) = *Apis agrorum* Fabricius, 1787 *nec* Schrank, 1781 [ = *Apis* [*Bombus*] *pascuorum* (Scopoli, 1736)], by designation of Sandhouse, 1943 : 523.

Synonym of *Thoracobombus* von Dalla Torre. **Syn. n.**
*AGRIBOMBUS* Skorikov, 1938 : 145. [Emend.]

1. ***ALPIGENOBOMBUS*** Skorikov, 1914 : 128.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus lefebvrei* Lepeletier, 1836. [ = *B. mastrucatus* Gerstäcker, 1869], by original designation. (p. 221).

*ALPIGENIBOMBUS* Skorikov, 1938 : 122. [Emend.]

18. ***ALPINOBOMBUS*** Skorikov, 1914 : 122.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bremus alpinus* (Linnaeus) = *Bombus alpinus* (Linnaeus) = *Apis alpinus* Linnaeus, 1758, by designation of Frison, 1927 : 66. (p. 239).

*ALPINIBOMBUS* Skorikov, 1937 : 53. [Emend.]

*ANODONTOMBUS* Krüger, 1917 : 61, 65.
Proposed as a sectional name but according to Milliron, 1961 : 53 it is synonymous with *Pyrobombus* von Dalla Torre, 1880.

*ATROCINTOB.* [*OMBUS*] Skorikov, 1933*b* : 244, Table 1.
Not described and no type-species designated, but two species, *Bombus atrocinctus* Smith, 1872 and *Bombus terminalis* Smith, 1872, were included. This must be treated as a *nomen nudum.*

*BOMBELLUS*, *Zool. Record, Insecta*, 1931 : 248, *nomen nudum.*
Not in Wild, 1931, *Scott. Nat.* 190 : 118, as claimed.

9. ***BOMBIAS*** Robertson, 1903 : 176.

Proposed as a genus. Type-species *Bombias auricomus* Robertson, 1903 [ = *B. nevadensis* Cresson, 1874 ssp.], by original designation (p. 230).

5. ***BOMBUS*** Latrielle, 1802a : 385, 1802b : 437.

Proposed as a genus. Type-species *Apis terrestris* Linnaeus, 1758, monobasic. (p. 266).

*BOOPOBOMBUS* Frison, 1927 : 62.
Sectional name.

*BREMUS* Jurine, 1801 : 164.
Proposed as a genus. Type-species *Bremus terrestris* (Linnaeus) = *Bombus terrestris* (Linnaeus) = *Apis terrestris* Linnaeus, 1758 by designation of Morice & Durrant, 1915 : 428. Invalidated, Hemming, 1939.

*CALLOBOMBUS* von Dalla Torre, see *Kallobombus* von Dalla Torre.

*CHROMOBOMBUS* von Dalla Torre, 1880 : 40.
Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus muscorum* (Linnaeus) = *Apis muscorum* Linnaeus, 1758, by designation of Sandhouse, 1943 : 538. Synonym of *Thoracobombus* von Dalla Torre. **Syn. n.**

21. ***COCCINEOBOMBUS*** Skorikov, 1922 : 157.

Proposed as a subgenus of *Alpigenobombus* Skorikov. Type-species *Alpigenobombus coccineus* (Friese) = *Bombus coccineus* Friese, 1903 : 254 by designation of Sandhouse, 1943 : 539. (p. 243).

7. ***CONFUSIBOMBUS*** Ball, 1914 : 78.

Proposed as a subgenus of *Bombus* latreille. Type-species *Bombus confusus* Schenck, 1859. Monobasic.

*CONFUSOBOMBUS* Skorikov, 1922 : 149 [apparently independently proposed as a subgenus of Bombus]. *Bombus confusus* Schenck, 1859 = *Confusobombus confusus* (Schenck) here designated as TYPE-SPECIES (p. 228). Synonym of *Confusibombus* Ball.

11. ***CROTCHIIBOMBUS*** Franklin, 1954 : 51.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus crotchii* Cresson, 1878 by original designation. (p. 231).

13. ***CULLUMANOBOMBUS*** Vogt, 1911 : 57.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bremus cullumanus* (Kirby) = *Bombus cullumanus* (Kirby) = *Apis cullumana* Kirby, 1802, by designation of Frison, 1927 : 66. (p. 233).

*CULLUMANIBOMBUS* Skorikov, 1938 : 145–146. [Emend.]

24. ***DIVERSOBOMBUS*** Skorikov, 1914 : 406.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus diversus* Smith, 1869 by designation of Sandhouse, 1943 : 546. (p. 247).

28. ***EVERSMANNIBOMBUS*** Skorikov, 1938 : 145.

Proposed as subgenus of *Agribombus* = *Agrobombus* Vogt. Included only *A.* (*E.*) *eversmanniellus* (Skorikov) = *Mucidobombus eversmanniellus* Skorikov, 1922 = *B. eversmanni* Friese, 1911 *nec B. modestus* Eversmann ssp. *eversmanni* Skorikov, 1910, which is here designated as the TYPE-SPECIES by monotypy and by virtual tautonymy. (p. 252).

29. ***EXILOBOMBUS*** Skorikov, 1922 : 150.

Proposed as a subgenus of *Mucidobombus* Skorikov. Type-species *Mucidobombus exil* [misprinted *exiln. nov*] Skorikov, 1922 = new name for *Bombus nymphae* Skorikov, 1909 ☿ only, not ♂ ♀. Monobasic. (p. 253).

35. ***FERVIDOBOMBUS*** Skorikov, 1922 : 153.

Proposed as a genus. Type-species *Bremus fervidus* (Fabricius) = *Fervidobombus fervidus* (Fabricius) = *Bombus fervidus* (Fabricius) = *Apis fervida* Fabricius, 1798, by designation of Frison, 1927 : 69. (p. 259).

6. ***FRATERNOBOMBUS*** Skorikov, 1922 : 156.

Proposed as a subgenus of *Alpigenobombus* Skorikov. Type-species *Alpigenobombus fraternus* (Smith) = *Bremus fraternus* (Smith) = *Bombus fraternus* (Smith) = *Apathus fraternus* Smith, 1854 by designation of Frison, 1927 : 63. (p. 227).

22. ***FUNEBRIBOMBUS*** Skorikov, 1922 : 157.

Proposed as a subgenus of *Alpigenobombus* Skorikov. Type-species *Alpigenobombus funebris* (Smith) = *Bombus funebris* Smith, 1854. Monobasic. (p. 244).

*HORTOMBUS* Vogt, 1911 : 56.
Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus hortorum* (Linnaeus) = *Apis hortorum* Linnaeus, 1761 by designation of Sandhouse, 1943 : 559.

Synonym of *Megabombus* von Dalla Torre.
*HORTIBOMBUS* Skorikov, 1938 : 146. [Emend.]

*HYPNOROBOMBUS* Quilis Pérez, 1927 : 97.

*HYPNORUBOMBUS* Quilis Pérez, 1927 : 19. [Error.]
Proposed as a subgenus of *Bombus*. Type-species *Bombus hypnorum* (Linnaeus) = *Apis hypnorum* Linnaeus, 1758. Monobasic.
Synonym of *Pyrobombus* von Dalla Torre.

4. ***KALLOBOMBUS*** von Dalla Torre, 1880 : 40.

*CALLOBOMBUS* von Dalla Torre, 1896 : 503. Invalid [emendation].
Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus soroeensis* (Fabricius) = *Apis soroeensis* Fabricius, 1777 by designation of Sandhouse, 1943 : 561. (p. 225).

*KOZLOVIBOMBUS* Skorikov, 1922 : 152.
Proposed as a genus. Type-species *Kozlovibombus kozlovi* (Skorikov) = *Bombus kozlovi* Skorikov, 1909 = *Bombus kohli* Vogt, 1909 *nec* Cockerell, 1906 by designation of Sandhouse, 1943 : 561.
Synonym of *Melanobombus* von Dalla Torre. **Syn. n.**

27. ***LAESOBOMBUS*** Skorikov, 1922 : 150.

Proposed as a subgenus of *Agrobombus* Vogt. Type-species *Agrobombus laesus* (Morawitz) = *Bombus laesus* Morawitz, 1875. Monobasic. (p. 251).

*LAESIBOMBUS* Skorikov, 1938 : 145. [Emend].

*LAPIDARIOBOMBUS* Vogt, 1911 : 58.
Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus lapidarius* (Linnaeus) = *Apis lapidaria* Linnaeus, 1758 by designation of Sandhouse, 1943 : 562.

Synonym of *Melanobombus* von Dalla Torre.
*LAPIDARIIBOMBUS* Skorikov, 1938 : 145–146. [Emend.]

*LAPPONICOBOMBUS* Quilis Pérez, 1927 : 19, 22, 63.

*LAPONICOBOMBUS* Neave, 1940 : 143. [Error.]
Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus lapponicus* (Fabricius) = *Apis lapponica* Fabricius, 1793 by designation of Milliron, 1961 : 58.
Synonym of *Pyrobombus* von Dalla Torre.

*LEUCOBOMBUS* von Dalla Torre, 1880 : 40.
Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus terrestris* (Linnaeus) = *Apis terrestris* Linnaeus, 1758 by designation of Sandhouse, 1943 : 564.
Synonym of *Bombus* Latreille s.s.

*MASTRUCATOBOMBUS* Krüger, 1917 : 66.
Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus mastrucatus* Gerstäker, 1869 [ = *Bombus lefebvrei* Lepeletier, 1836). Monobasic.
Synonym of *Alpigenobombus* Skorikov.

23. ***MEGABOMBUS*** von Dalla Torre, 1880 : 40.

[*MEGALOBOMBUS* Schulz, 1906 : 267. Invalid emendation].
Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus ligusticus* Spinola, 1805 = *Apis argillacea* Scopoli, 1763. Monobasic. (p. 246).

15. ***MELANOBOMBUS*** von Dalla Torre, 1880 : 40.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus lapidarius* (Linnaeus) = *Apis lapidaria* Linnaeus, 1758 by designation of Sandhouse, 1943 : 569. (p. 236).

8. ***MENDACIBOMBUS*** Skorikov, 1914 : 125.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus mendax* Gerstäker, 1869 by designation of Sandhouse, 1943 : 572. (p. 229).

32. ***MUCIDOBOMBUS*** Skorikov, 1922 : 149.

Proposed as a genus. Type-species *Bombus mucidus* Gerstäker, 1869 by designation of Sandhouse, 1943 : 574. (p. 256).

*NEVADENSIBOMBUS* Skorikov, 1922 : 149.

Proposed as a genus. Type-species *Bremus nevadensis* (Cresson) = *Bombus nevadensis* Cresson, 1874 by designation of Frison, 1927 : 64.

Synonym of *Bombias* Robertson, 1903.

2. ***NOBILIBOMBUS*** Skorikov, 1933a : 62.

Proposed as a genus but no type-species was designated. Listed by Sandhouse (1943 : 577) but without type-designation. Type-species cited as *Bombus nobilis* Skorikov, 1904 by Milliron, 1961 : 54 but there is no such species. TYPE-SPECIES of the subgenus is here fixed as *B. nobilis* Friese (1904) 1905 by virtual tautonymy. The nature of this species is unfortunately controversial (see p. 222) but I believe this arrangement to be the best at the moment.

*OBERTOBOMBUS* Reinig, 1930 : 107.

Proposed as a subgenus of *Bombus* Latreille. *Type*-species *Bombus oberti* Morawitz, 1883. Monobasic.

Synonym of *Sibiricobombus* Vogt. **Syn. n.** [but see Sandhouse, 1943 : 579].

*ODONTOBOMBUS* Krüger, 1917 : 61, 65.

Proposed as a sectional name but stated by Milliron, 1961 : 57 to be equivalent to *Megabombus* von Dalla Torre.

3. ***ORIENTALIBOMBUS*** Richards, 1929 : 378.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus orientalis* Smith, 1854 by original designation. (p. 224).

*POECILOBOMBUS* von Dalla Torre, 1882 : 23.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus sitkensis* Nylander, 1848 by designation of Sandhouse, 1943 : 589. Synonym of *Pyrobombus* von Dalla Torre.

*POMOBOMBUS* Krüger, 1917 : 65.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus pomorum* (Panzer) = *Bremus pomorum* Panzer, 1804 by designation of Sandhouse, 1943 : 589.

Synonym of *Rhodobombus* von Dalla Torre.

*POMIBOMBUS* Skorikov, 1938 : 145–146. [Emend.]

*PRATOBOMBUS* Vogt, 1911 : 49.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bremus pratorum* (Linnaeus) = *Bombus pratorum* (Linnaeus) = *Apis pratorum* Linnaeus, 1761 by designation of Frison, 1927 : 67.

Synonym of *Pyrobombus* von Dalla Torre.

*PRATIBOMBUS* Skorikov, 1937 : 59; 1938 : 146. [Emend.]

16. ***PRESSIBOMBUS*** Frison, 1935 : 342.

Proposed as a subgenus of *Bremus* Panzer. Type-species, monobasic and by original designation, *Bremus pressus* Frison, 1935 = *Bombus pressus* (Frison). (p. 237).

14. ***PYROBOMBUS*** von Dalla Torre, 1880 : 40.

*PYRRHOBOMBUS* von Dalla Torre, 1882 : 28. [Invalid emendation.]

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus hypnorum* (Linnaeus) = *Apis hypnorum* Linnaeus, 1758. Monobasic. (p. 234).

34. ***RHODOBOMBUS*** von Dalla Torre, 1880 : 40.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bremus pomorum* Panzer, 1804 = *Bombus pomorum* (Panzer) by designation of Sandhouse, 1943 : 596. (p. 258).

19. ***ROBUSTOBOMBUS*** Skorikov, 1922 : 157.

Proposed as a subgenus of *Alpigenobombus* Skorikov. Type-species *Alpigenobombus robustus* (Smith) = *Bombus robustus* Smith, 1854 by designation of Sandhouse, 1943 : 597. (p. 240).

20. ***RUBICUNDOBOMBUS*** Skorikov, 1922 : 154.

Proposed as a subgenus of *Fervidobombus* Skorikov. Type-species *Fervidobombus rubicundus* (Smith) = *Bombus rubicundus* Smith, 1854 by designation of Sandhouse, 1943 : 597. (p. 241).

17. ***RUFIPEDIBOMBUS*** Skorikov, 1922 : 156.

*RUFIPEDOBOMBUS* Milliron, 1961 : 54. [Error].

Proposed as a genus. Type-species *Rufipedibombus rufipes* (Lepeletier) = *Bombus rufipes* Lepeletier, 1836. Monobasic. (p. 238).

*RUFOCINCTOBOMBUS* Frison, 1927 : [78] pl. 17, fig. 9.

Type-species *Bremus rufocinctus* (Cresson) = *Bombus rufocinctus* Cresson, 1863, monobasic. Presumably an error since on p. 65 Frison uses the name *Cullumanobombus*.

Synonym of *Cullumanobombus* Vogt.

25. ***SENEXIBOMBUS*** Frison, 1930 : 3.

Proposed as a subgenus of *Bremus* Panzer. Type-species *Bremus senex* (Vollenhoven) = *Bombus senex* Vollenhoven, 1873 by original designation. (p. 248).

10. ***SEPARATOBOMBUS*** Frison, 1927 : 64.

Proposed as a subgenus of *Bremus* Panzer. Type-Species *Bremus separatus* (Cresson) = *Bombus separatus* Cresson, 1863 = *Apis griseocollis* Degeer, 1773 by original designation. (p. 231).

12. ***SIBIRICOBOMBUS*** Vogt, 1911 : 60.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus sibiricus* (Fabricius) = *Apis sibirica* Fabricius, 1781 by designation of Sandhouse, 1943 : 599. (p. 232).

*SIBIRICIBOMBUS* Skorikov, 1938 : 145–146. [Emend.]

*SOROEENSIBOMBUS* Vogt, 1911 : 63.

*SOROËNSIBOMBUS* Skorikov, 1923 : 151. [Error.]

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus soroeensis* (Fabricius) = *Apis soroeensis* Fabricius, 1777. Monobasic.

Synonym of *Kallobombus* von Dalla Torre.

33. ***SUBTERRANEOBOMBUS*** Vogt, 1911 : 62.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bremus subterraneus* (Linnaeus) = *Bombus subterraneus* (Linnaeus) = *Apis subterranea* Linnaeus, 1758 by designation of Frison, 1927 : 68. (p. 257).

*SUBTERRANEIBOMBUS* Skorikov, 1938 : 145–146. [Emend].

*SULCOBOMBUS* (Vogt) Krüger, 1917 : 65.

Proposed as a group name to include *Mendacibombus* and *Confusobombus*, but type-species designated by Sandhouse, 1943 : 502 as *Bombus confusus* Schenck, 1859.

Synonym of *Confusibombus* Ball.

*TANGUTICOBOMBUS* Pittioni, 1939*b* : 201.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus tanguticus* Morawitz, 1886. Monobasic and by original designation.

Synonym of *Melanobombus* von Dalla Torre. **Syn. n.**

*TERRESTRIBOMBUS* Vogt, 1911 : 55.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bremus terrestris* (Linnaeus) = *Bombus terrestris* (Linnaeus) = *Apis terrestris* Linnaeus, 1758 by designation of Frison, 1927 : 67.

Synonym of *Bombus* Latreille.

31. ***THORACOBOMBUS*** von Dalla Torre, 1880 : 40.

Proposed as a subgenus of *Bombus* Latreille. Type-species *Bombus sylvarum* (Linnaeus) = *Apis sylvarum* Linnaeus, 1761 by designation of Sandhouse, 1943 : 604. (p. 255).

26. ***TRICORNIBOMBUS*** Skorikov, 1922 : 1515.

Proposed as a subgenus of *Agrobombus* Vogt. Type-species *Agrobombus tricornis* (Radoszkowsky) = *Bombus tricornis* Radoszkowsky, 1888. Monobasic. (p. 249).

*UNCOBOMBUS* Krüger, 1919 : 65.

Proposed as a group name to include *Lapidariobombus*, *Pratobombus*, *Cullumanobombus* and *Mastrucatobombus*.

*VOLUCELLOBOMBUS* Skorikov, 1922 : 149.

Proposed as a genus. Type-species *Volucellobombus volucelloides* (Gribodo) = *Bombus volucelloides* Gribodo, 1891. Monobasic.

Synonym of *Robustobombus* Skorikov. **Syn. n.** The page priority of *Volucellobombus* is ignored because the male of *B. volucelloides* is unknown whereas both sexes are known in *B. robustus* Smith.

## NOTE ON GROUP-NAMES

A few of the names in the above list seem certainly to have been intended for groups of subgenera. Where a type has been fixed they would be available as subgeneric names though as it happens none has priority. Where a type has not already been fixed I have not done so. The concepts indicated by these names (sometimes emended during the present study) seem to be as follows:

*Anodontobombus* Krüger = Subgenera 1–22
*Boopobombus* Frison = Subgenera 6–9
*Odontobombus* Krüger = Subgenera 23–35
*Sulcobombus* Krüger = Subgenera 7–8
*Uncobombus* Krüger = Subgenera 10–14, possibly also 15–17. Originally subgenera 1 and 13–15.

## CHARACTERS OF THE SUBGENERA OF *BOMBUS*

The order in which the subgenera are arranged below will perhaps be found convenient but it is not intended to have a very deep phylogenetic significance. It is very difficult to form a theory of the evolution of *Bombus*. The suggestion of Milliron (1961 : 50) that *B. mendax* Gerstäcker has Anthophorine affinities, whereas *B. fraternus* (Smith) arose from some Xylocopine stock seems to me fantastic. *Euglossa* and its allies are perhaps the non-social bees most similar to *Bombus*. If one regards short tongues and malar spaces as primitive, then the serrate mandible of *Alpigenobombus* which accompanies them is surely highly specialized; the habit of biting through the base of the corolla can scarcely be primitive. Nevertheless a long malar space is practically unknown in any other bee-genus (Michener, 1944 : 205 otherwise only in *Apis*, some *Trigona*, *Thrinchostoma*, and some *Colletes*).

On the grounds of nest-behaviour and brood-rearing, the section *Odontobombus* has been regarded as primitive (Sladen, 1912 : 43 ; Plath, 1934 : 119) but it is not certain that structural evolution has necessarily kept pace with evolution of social behaviour. The data recorded by Hobbs (1964) make it difficult to construct a combined phylogeny. Certain groups of subgenera seem clearly closer to one another structurally than to the others ; in the present arrangement such groups are: 1–2, 6–9, 13–16, 19–20, 23–25, 26–32, 34–35.

There are certain characters of subgeneric importance which have not been previously fully described or which require a scheme of nomenclature. Some terms have already been suggested in Richards (1927), others are noted below.

*Measurements* were made with a micrometer scale in the microscope eyepiece. Since in general only proportions are important the measurements are expressed in micrometer units which are equal to 0·073 mm. The following structures have been measured, ♀ length of malar space, proportions of antennal segments 3 : 4 : 5 ; ♂ length of malar space, proportions of antennal segments 3 : 4 : 5 : 8, length × greatest width of mid and hind basitarsus.

While the absolute length of the malar space is given, it is usually best to measure it against that of the third antennal segment. I have found it more satisfactory to measure its length as in Text-fig. 1 (cd) rather than obliquely (bd) as proposed by Krüger (1920 : 316, fig. B).

*Frons*. In the female, on each side of the frons, beside the lateral ocelli, are roundish, unpunctured areas (Text-fig. 2). Between these unpunctured areas and the eyes, lying along the inner orbit, is often a band of special sculpture. Krüger (1951 : 144) first showed the importance of these areas and it is illustrated by Moure & Sakagami (1962 : 85, fig. 1) in several species of *Fervidobombus* ; the sculpture is less specific in the males. In some subgenera a furrow, sometimes weak, transverses the top of the gena (temples) a little below the dorsal limit of the eyes. This will be termed the dorsal furrow of the gena. It is of minor subgeneric importance but in some groups it is a specific character of some value. It is best developed in *Pyrobombus* and absent in most *Odontobombus*. It is weaker in the males.

*The sting*. Various authors have pointed out the significance of the inner thickenings of the sting-sheath (= *incrustaciones vestibuli aculei*). The outer thickenings should also be examined, though less significant. The membrane between the inner thickenings (presumably in the region of the genital orifice) is often thrown into characteristic folds ; there are sometimes blackened patches in the membrane and, at least in *Pyrobombus*, these are not present in virgins and are scars produced during copulation by the male (probably by the sagittae) (Cumber, 1949 : 24). If the sting is fully extruded over the dorsal side of the abdomen, the sting-sheath forms a V of which the point is dorsal. In descriptions, the sting is described in this orientation and the essential parts are lettered in Text-fig. 3 (p. 223).

*The male genitalia.* The nomenclature of the male genitalia in Hymenoptera has been the subject of much controversy and I have earlier indicated a number of the alternatives (Richards, 1956). In the present work it has proved most convenient to use the old-fashioned nomenclature. The chief reason for this is that Snodgrass (1940 : 59–60) quoting Zander (1900 : fig. 5) gives evidence for believing that the lacinia and the squama are parts of one structure, the parameral spine. Nevertheless, it is essential for taxonomic purposes to distinguish them and to do this the old-fashioned terms seem the best ; once using part of the system it then seems best to use the same nomenclatorial scheme throughout (Text-fig. 4).

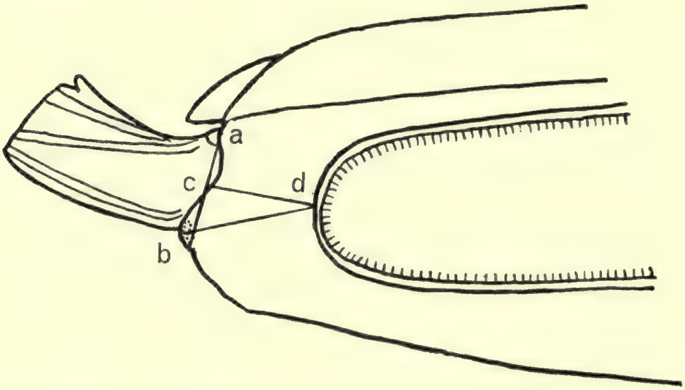


FIG. 1. Method of measuring length of malar space.

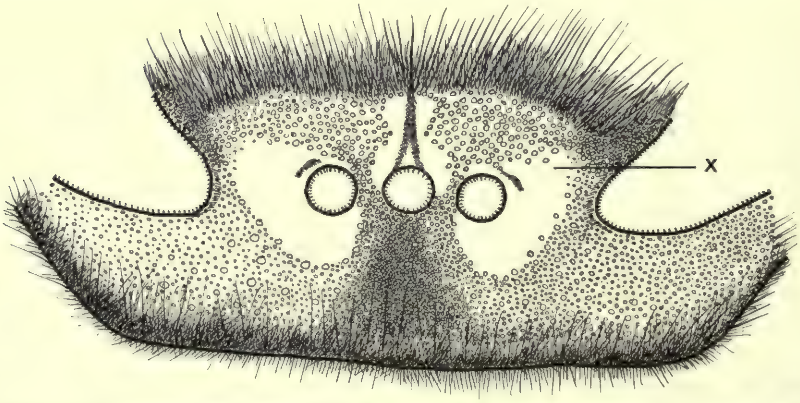


FIG. 2. Unpunctured areas (X) of frons of *Bombus terrestris* (Linnaeus), ♀.

I have only illustrated stings and male sternites and genitalia which have not been illustrated before. The scale lines are equal to 1·0 mm. for stings and to 2·5 mm. for the male sternites and genitalia.

## DESCRIPTIONS OF THE SUBGENERA

### 1. ***ALPIGENOBOMBUS*** Skorikov, 1914

*Mastrucatobombus* Krüger, 1917

♀. Ocelli separated by three diameters from eyes, lying just in front of postocular line, median ocellus almost in a straight line with lateral ones. Frons moderately closely and strongly punctured, unpunctured areas large but ill-defined, with some large punctures on their outer part, a feebly developed band of fine punctures along the inner margin of eyes. Dorsal furrow of gena usually present. Antennal segments 3 : 4 : 5 as 7½ : 4½ : 6½, segment 3 about twice to nearly three times as long as broad. Clypeus very transverse, swollen, closely but not very coarsely punctured throughout, apical impression very feeble, with rather dense punctures. Labral tubercles flattened, sharply truncate at inner end, furrow wide and deep, wider than length of antennal segment 3, lamella wide almost straight. Mandibles strongly curved, spoon-shaped, apex with six marginal teeth, incisura deep, no sulcus obliquus. Malar space short, very transverse, hardly longer than antennal segment 5 (= 7–7½), sometimes with some fine punctures. Mid basitarsus with posterior apical angle more or less distinctly acute. Hind tibia with corbicular surface bare, feebly reticulate, corbicular bristles normal, dorsal inner apical angle rather distinctly spinose, hind basitarsus with posterior dorsal angle obtusely spinose, surface not densely pubescent but in most species with some long bristles arising from lower edge and adjacent disk, especially proximally. Gastral tergite 6 reticulate or subrugose, sometimes with a feeble short furrow or very small posterior boss, short hairs not conspicuous. Sting with outer thickenings of sheath narrow and hardly widened above, inner thickenings a little widened below and gradually narrowed upwards, the degree of widening varying, centre or sometimes more of wide part blackened and membrane blackened on a lateral lobe projecting down to about mid point. Wings hyaline or in eastern species blackish.

♂. Eyes not swollen, ocelli separated by three diameters from eyes, lying almost on the postocular line. Antennae not very long, penultimate segments not curved, segments 3 : 4 : 5 :8 = 7 : 4½ : 6½ : 6. Mandibles with a broad ventral and two small dorsal teeth, beard long and dense. Malar space transverse, shorter than antennal segment 5 (= 6). Mid basitarsus moderately long and parallel-sided (40 × 9), posterior edge with quite numerous long bristles, anterior edge also with a few. Hind tibia considerably widened distally, moderately convex, shining with large bare distal disk, both edges with very long hairs. Hind basitarsus 40 × 12, dorsal apical angle subacute, dorsal edge with a few long bristles. Gastral sternite 6 scarcely modified, a little truncate. Gastral sternite 7 wide, widely produced, end somewhat truncate, no fenestrae, bristles short and inconspicuous. Gastral sternite 8 strongly produced, produced part with sides somewhat convergent, end obtusely angulated, one central line, bristles short and dense. Genitalia rather long and narrow, stipes with a deep, wide inner impression; sagittae narrow, much wider in side view, especially towards base which is followed by a ventral emargination forming a blunt tooth, apex bent down and hooked inwards, hook rather wide, tip rounded, outer edge with a narrow nearly straight flange, proximal end of flange projecting a little ; spatha with sides strongly converging, at mid-point two and a half to three times as wide as sagitta ; squama rounded quadrate or pointed inwards, proximal inner lobe narrow and separated from main lobe by a narrow emargination ; lacinia projecting well beyond squama, curved, parallel-sided, end emarginate with inner angle acute, with a small bristle-tuft ; volsella region with or without dense bristles.

Illustrations. ♀ sting—Hazeltine & Chandler 1964 : pl. 6. ♂ Gastral sternite 7 and 8—Pittioni, 1939a : pl. 3, fig. 5 ; Frison, 1935 : figs. 5d, e, 6e, f. Genitalia—Krüger, 1920 : pl. 6, fig. q ; Pittioni, 1939a : pl. 3, fig. 5 ; Frison, 1935 : figs. 5b, 6c.

N.W. SPAIN, PYRENEES, ALPS and NORWAY to CHINA and HIMALAYAS.

## 2. *NOBILIBOMBUS* Skorikov, 1933

(Text-figs. 3–6)

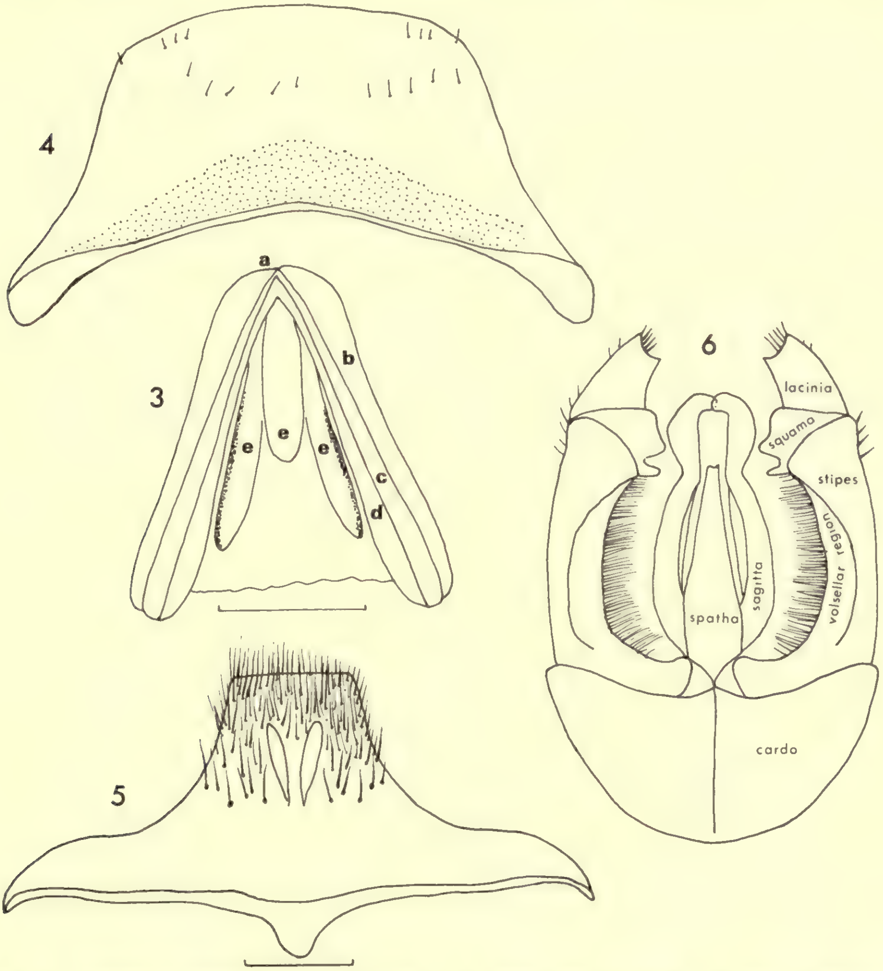
Skorikov (1933a : 62) published a new subgenus, *Nobilibombus*, including three species, *B. nobilis* Friese, *B. validus* Friese, and the later described *B. morawitziides* Skorikov. No male was known. No type-species of the subgenus was fixed but under the International Code of Zoological Nomenclature, Art. 68(c), *B. nobilis* Friese can be regarded as the type-species by virtual tautonymy.

Friese's description ( (1904) 1905 : 513) mentions that the mandibles have four to five teeth and the species is recorded from several localities in W. China (8 ♀, 6 ☿). On p. 510, *B. validus* is stated to have untoothed mandibles. Nevertheless, in the review of palearctic species (pp. 516–523), he places (p. 517) *B. validus* in a group with *B. mastrucatus* Gerstäcker which he says has a short malar space and toothed mandibles. On the other hand, *B. nobilis* (p. 519) is placed in a group with *B. lapidarius* (Linnaeus) among the species in which the mandibles are untoothed. Dr. B. Tkalců has seen a " type ♀ " of *B. nobilis* from Friese's collection and it is a species of subgenus *Melanobombus* von Dalla Torre [= *B. pyrosoma* Morawitz, 1890 ssp. *hönei* Bischoff, 1936]. It seems quite likely that Friese's series was mixed and that this led to the confusion already noted in the description. It seems difficult to believe that Skorikov could have erected the subgenus *Nobilibombus* for species with toothed mandibles and with malar space longer than in *Alpigenobombus*, unless most of Friese's specimens (now at Leningrad) had these characters. Unfortunately it has not proved possible to examine the whole series or indeed any specimen other than the one retained by Friese.

The characters of the subgenus given below are taken from *B. sikkimi* Friese and its differentiation from other subgenera will be seen in the keys (pp. 260, 265).

♀. Ocelli separated by about three diameters from eyes, lying well in front of the postocular line, median ocellus almost in line with the lateral ones. Frons with fine and indistinct though fairly numerous punctures, especially along inner margins of eyes, unpunctured areas small and ill-defined. Dorsal furrow of gena present but usually very weak. Antennal segments 3 : 4 : 5 = 10½ : 5 : 7, segments 3 about three times as long as wide in centre. Clypeus about quadrate, rather swollen, with scattered sparse punctures of variable size, apical impressions moderate, with rather close, large punctures. Labral tubercles considerably raised, angulated at inner end, shining and coarsely punctured, furrow rather narrow, less wide than length of antennal segment 3, lamella nearly straight, almost as wide as a tubercle. Mandibles with six apical teeth, the ventral one at bottom of the incision large and directed downwards, almost at right angles to the others, no sulcus obliquus. Malar space quadrate, longer than antennal segment 3 (= 15). Mid basitarsus with posterior apical angle spinosely produced, whole surface with relatively long bristles and on basal half with very long, obliquely erect ones. Hind tibia with corbicular surface bare, very feebly reticulate, corbicular bristles normal, dorsal inner apical angle scarcely produced. Hind basitarsus posterior dorsal angle acute, surface rather densely pubescent, dorsal edge with moderately short dense bristles, ventral part of disk and lower edge with long bristles, especially on basal half, almost like those of corbicle. Gastral tergite 6 somewhat truncate. Characters of sting (Text-fig. 3) essentially similar to *Alpigenobombus*. Wings subhyaline.

♂. Eyes not swollen, ocelli separated by three diameters from eyes, lying about on the postocular line. Antennae not very long, penultimate segments not curved, segments 3 : 4 : 5 : 8 = 7½ : 5½ : 7 : 7. Mandibles with a distinct ventral and two small dorsal teeth, the most dorsal one not very distinct, beard long and dense. Malar space distinctly longer than broad, longer than antennal segments 2 + 3 but shorter than 3 + 4 (= 12). Mid basitarsus long and parallel-sided (45 × 11), margins especially posterior one with many long hairs. Hind tibia distally a little concave with a large bare disk, both margins and proximal half of disk with very long bristles, at least twice as long as its greatest width. Hind basitarsus 50 × 13, dorsal apical angle just acute, surface with dense, tomentum-like hairs and on disk many very long bristles especially on margins. Gastral sternite 6 with apical margin rounded and a little thickened with a dense short postapical fringe. Gastral sternite 7 (Text-fig. 4) very widely crescentic (i.e. long in longitudinal direction), no lines or fenestrae, one long bristle on each side. Gastral sternite 8 (Text-fig. 5b) strongly produced, sides feebly convergent, distal angles almost rounded, apex truncate or feebly curved, no fenestrae but distal half with two lines enclosing a very narrowly pyriform area, surface with dense short bristles. Genitalia (Text-fig. 6) large and rather long, stipes with a wide sharply defined impression, sagittae narrow, much wider



Figs. 3–6. *Bombus sikkimi* Friese. 3, sting : a, dorsal end of sting ; b, outer thickening of sheath, c ; d, inner thickening ; e, folds in membrane. 4, gastral sternite 7 of ♂ ; 5, gastral sternite 8 of ♂ ; 6, ♂ genitalia, the essential parts labelled.

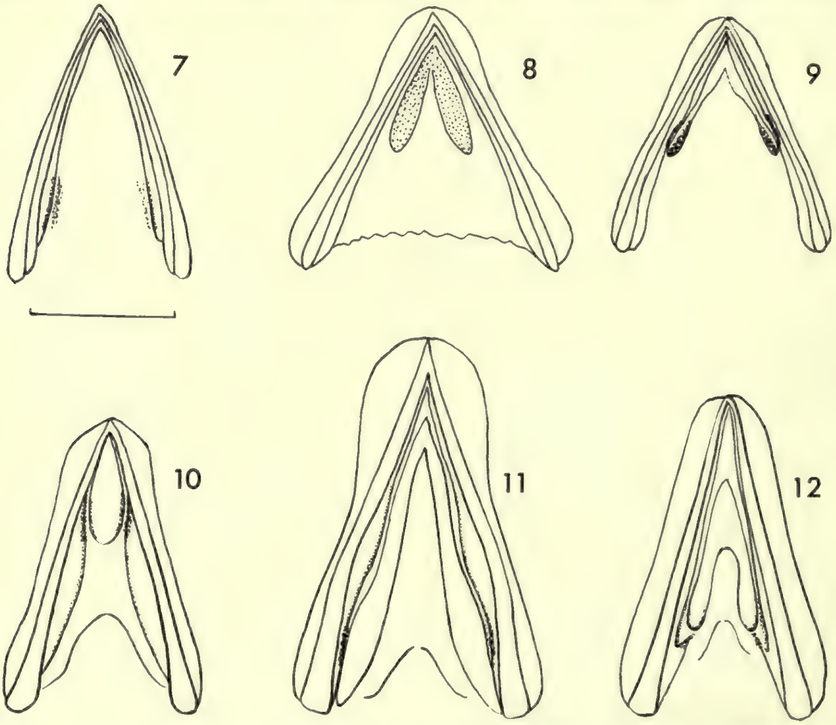
in side view with a small ventral tooth at end of postbasal emargination, apex bent downwards and hooked inwards, apex of hook just blunt, outer side with a moderate flange which widens anteriorly but does not form a tooth ; spatha wide, sides strongly convergent, at centre 2–3 times as wide as adjacent sagitta ; squama very transverse, inner side much wider than outer side, an inner projection forming a rounded-squarish lobe, extending some way beyond the stipes, and separated from this a narrow emargination a small proximal lobe ; lacinia extending some way beyond the squama, wide, feebly curved and parallel-sided, outer edge raised into a keel just inside the edge, apex feebly emarginate, outer corner rounded, inner one forming a feeble tooth ; volsellar region with dense, moderately long bristles.

Illustrations. Sting—Text-fig. 3. Gastral sternites 7 and 8—Text-figs 4 and 5. Genitalia—Text-fig. 6.

HIMALAYAS (s.l.) (W. INDIA to N. CHINA).

## 3. ***ORIENTALIBOMBUS*** Richards, 1929

♀. Ocelli separated by nearly three diameters from eyes, lying well in front of postocular line. Frons with a large unpunctured area around the ocelli, only a few fine punctures in front of each lateral ocellus and some rather fine punctures along inner margins of eyes. Dorsal furrow of gena sometimes feebly developed posteriorly. Antennal segments $3 : 4 : 5 = 10 : 6\frac{1}{2} : 7\frac{1}{2}$, segment 3 about two and a half times as long as broad. Clypeus elongate, swollen, little punctured, apical impressions feeble, little punctured. Labral tubercles angularly convex but not specially so at inner angles, furrow wide, wider than length of antennal segments $2 + 3$, lamella wide, nearly straight. Mandibles with no incisura, salcus obliquus well-marked



FIGS. 7–12. Stings of 7, *Bombus funerarius* Smith ; 8, *B. mendax* Gerstäcker ; 9, *B. vorticosus* Gerstäcker ; 10, *B. pressus* (Frison) ; 11, *B. eximius* Smith ; 12, *B. robustus* Smith.

(weaker in *B. funerarius* Smith). Malar space very long, longer than antennal segments 2 + 3 (= 19). Mid basitarsus with posterior apical angle obtuse. Hind tibia with corbicular surface bare, surface not reticulate, corbicular bristles normal, dorsal inner apical angle rather obtusely produced. Hind basitarsus broad, slightly narrowed to the apex, dorsal apical angle just acute, surface with fine bristles not dense, marginal bristles short and dense. Gastral tergite 6 sometimes with a feeble posterior furrow, its short hairs directed inwards. Sting with outer thickenings of sheath of moderate, even width, inner thickening moderately widened below and narrowing gradually above, lower part of inner edge blackened for a considerable distance and the adjacent membrane also blackened. Wings dark.

♂. Eyes not swollen, ocelli separated by three diameters from eyes, lying just in front of postocular line. Antennae very long, penultimate segments each a little curved, segments 3 : 4 : 5 : 8 = 7½ : 8½ : 11½ : 13. Mandibles with a broad ventral and one small dorsal tooth, beard long and dense. Malar space much longer than broad, a little longer than antennal segments 2 + 3 but shorter than 3 + 4 (= 13½), or in *B. funerarius* Smith a little longer than 3 + 4 (= 14), not punctured. Mid basitarsus long and broad (48 × 13), fringes short. Hind tibia considerably widened and flattened distally, disk bare, fringes moderately dense but only a few bristles as long as maximal tibial width (fringes longer in *B. funerarius* Smith). Hind basitarsus 49 × 15, apical angle just acute, hairs of surface not dense, fringes short. Gastral sternite 6 with end thickened and recurved, especially on central quarter, followed by a membrane and a long, rather dense fringe, still longer at each side. Gastral sternite 7 forming a wide transverse band with anterior and posterior margins subparallel, latter feebly bisinuate, surface with sparse, scattered, short bristles. Gastral sternite 8 in the form of narrow band produced into a very wide tongue-shaped process, sides slightly rounded and angles just rounded, apex very feebly emarginate, surface densely covered with short bristles, three small fenestrae on mid-line (except in *B. funerarius* Smith). Genitalia very large and rather elongate, stipes broad with a wide, fairly well-defined impression ; sagittae narrow and very little wider in side view, with a strong recurved tooth near mid-point beneath, apex somewhat downcurved, ending in a long point, with a very slight flange on outer edge ; spatha narrow, hardly wider than sagitta ; squama large, transverse, somewhat wider on inner than outer-side, projecting in a little past the stipes, all angles rounded ; lacinia mostly narrow, parallel-sided, curving inwards, projecting well beyond squama, apex curved over inwards and truncate, dorsal corner acute, from base of lacinia and hidden by the squama arises a long, complex, pointed process ; or, in *B. funerarius* Smith, lacinia forms a long acute process and beneath the squama bears a small equilateral triangular process ; volsella region with dense, moderately long hairs.

Illustrations. Sting—Richards, 1929 : fig. 3 ; Text-fig. 7. Gastral sternites 7 and 8—Frison, 1935 : figs. 4d, e, b, 7d, e ; Richards, 1929 : fig. 1. Genitalia—Richards, 1929 : fig. 3 ; Frison, 1935 : fig. 7c.

HIMALAYAS, S.W. CHINA. *Bombus funerarius* Smith (♂ = *Bremus priscus* Frison, 1935) is unusually distinct but probably best included.

## 4. ***KALLOBOMBUS*** von Dalla Torre, 1880

*Soroeensibombus* Vogt, 1911

♀. Ocelli separated by rather more than three diameters from eyes, lying almost behind the postocular line. Frons rather closely but not very strongly punctured, unpunctured areas small but well-defined, a wide band of fine punctures along inner margins of eyes. Dorsal furrow of gena just indicated. Antennal segments 3 : 4 : 5 = 7 : 5 : 5½, segment 3 about twice as long as broad. Clypeus rather short and swollen, rather strongly and evenly punctured, apical impressions strongly but not more closely punctured. Labral tubercles not much raised, moderately angled at inner end, furrow narrow, not as broad as length of antennal segment 3, lamella short and curved, inconspicuous. Mandibles with no incisura or salcus obliquus. Malar space just transverse, a little longer than antennal segment 3 (= 8). Mid basitarsus with posterior apical angle obtuse. Hind tibia with corbicular surface bare, surface moderately reticulate, dorsal inner apical angle not produced. Hind basitarsus with dorsal angle moderately acute, surface not densely haired, bristles rather short. Gastral tergite 6 feebly sculptured, rather shining. Sting with outer thickening of sheath moderately wide, especially above, inner thickenings widening rather strongly upwards to above middle, then suddenly narrowed, wide part a little blackened at its edge, no black spots in membrane but a slight dorsal fold. Wings evenly but not strongly infuscate.

♂. Eyes not swollen, ocelli separated by fully three diameters from eyes, lying just behind the postocular line. Antennae, long, penultimate segments each a little curved, segments 3 : 4 : 5 : 8 = 4½ : 5½ : 6½ : 7. Mandibles with a broad ventral and small dorsal tooth, beard long and dense. Malar space quadrate, longer than antennal segments 2 + 3, shorter than 3 + 4 (= 7), not punctured. Mid basitarsus not very long, nearly parallel-sided but a little narrowed at each end (37 × 8), fringes short. Hind tibia moderately convex, with a considerable shining, nearly bare disk, fringes long, especially the dorsal one. Hind basitarsus 34 × 10, considerably narrowed at base, apical angle just acute, fringes short. Gastral sternite 6 a little produced on central quarter, not recurved, scarcely thickened, with a short postapical fringe. Gastral sternite 7 strongly produced, sides of produced part with a large submembranous, transparent area, apex shallowly emarginate, with a narrow band of dense bristles of which some on each side are longer. Gastral sternite 8 produced, production relatively narrow and parallel-sided, angles rounded, apex scarcely emarginate, a considerable area of dense short bristles, no fenestra but two parallel lines meeting before apex. Genitalia markedly elongate, stipes with no real inner impression ; sagittae narrow, bent down at apex, hooked outwards, hook forming a sort of half arrowhead, tip rounded (*proteus* Gerstäcker) or pointed (*soroeensis* (Fabricius)), tip of hook pointed, sagitta also narrow in side view but with a large isolated pointed tooth beneath centre ; spatha wide, sides strongly converging, at centre three times as wide as sagitta ; squama elongate, almost twice as long as broad, inner edge with a shallow emargination, all corners rounded ; lacinia long, curved inwards, projecting well beyond squama, apex emarginate, outer corner sharp, inner one forming a curved, feebly serrate hook, between them a small tuft of bristles ; volsella regions with dense short hairs.

Illustrations. Sting—Richards, 1927 : fig. 54 ; Hazeltine & Chandler, 1964 : pl. 6. Gastral sternites 7 and 8—Radoszkowsky, 1884 : fig. 34c ; Pittioni, 1939a : pl. 2, fig. 6. Genitalia—Krüger, 1920 : pl. 7, fig. u ; Richards, 1927 : fig. 54 ; Pittioni, 1939a : pl. 2, fig. 6.

EUROPE and adjacent parts of ASIA.

## 5. *BOMBUS* Latreille, 1802a (s.s.)

*Leucobombus* von Dalla Torre, 1880
*Terrestribombus* Vogt, 1911

♀. Ocelli separated by nearly three diameters from eyes, lying just in front of postocular line. Frons with numerous punctures, mostly fine and coarse mixed, with well-defined unpunctured areas and a band of close, mostly fine punctures along inner margins of eyes. Dorsal furrow of gena absent or very weak ; a little stronger in *B. ignitus* Smith. Antennal segments 3 : 4 : 5 = 9 : 6 : 7, segment 3 twice as long as broad. Clypeus short, convex, closely and rather strongly punctured throughout and especially closely in the well-marked apical impressions. Labral tubercles flattened, angled at inner end, furrow narrow, less wide than length of antennal segments, lamella short, somewhat curved. Mandibles with a strong incisura and moderately distinct sulcus obliquus. Malar space transverse, shorter than antennal segments 2 + 3 (= 9). Mid basitarsus with posterior apical angle obtuse. Hind tibia with corbicular surface bare, very weakly reticulate, dorsal inner apical angle distinctly produced. Hind basitarsus with dorsal angle just acute, surface densely pubescent, bristles short. Gastral tergite 6 feebly sculptured, rather shining. Sting with outer thickenings of sheath narrow but broadened dorsally, inner thickenings rather wide and twice emarginate, membrane between thrown into central and lateral folds. Wings moderately or in some species strongly infuscate.

♂. Eyes not swollen, ocelli separated by three diameters from eyes, lying on the postocular line. Antennae of moderate length, segments 3 : 4 : 5 : 8 = 7 : 5 : 6 : 6½. Mandibles with a broad ventral and small dorsal tooth, beard long and dense. Malar space almost transverse, longer than antennal segment 3 but shorter than 2 + 3 (= 9), with some fine punctures. Mid basitarsus relatively broad and parallel-sided (46 × 12), fringes short. Hind tibia slightly convex but somewhat hollowed out towards dorsal margin, bare after proximal quarter, fringes, especially the dorsal one, long. Hind basitarsus 45 × 15, distal angle just acute, fringes short. Gastral sternite 6 with margin considerably recurved and thickened and with a dense short postapical fringe. Gastral sternite 7 very transverse, posterior margin rounded with a central emargination, a group of 3–5 long bristles on each side, no lines or fenestrae. Gastral sternite 8 broad, produced, trapeziform, sides strongly converging, apex weakly emarginate with corners angled, tufts of long bristles arising near these angles, no lines or fenestrae. Genitalia with very slight inner impressions on stipes ; sagittae narrow in dorsal view but undulating and widely flaring at apex, in side view very wide, deeply emarginate beneath just after base, apex widened and somewhat curved outwards, spatha wide, at least four times as wide as dorsal width of sagitta ; squama very transverse with an anterior submembranous inner projection separated from the main lobe by a deep emargination, main lobe expanded inwards in a more or less trumpet-shaped projection ; lacinia projecting very little beyond squama, end part transverse, strongly produced inwards into a process ending in a slight upturned hook, hind margin somewhat roughened and with dense pubescence ; volsella region with short, rather sparse hairs.

Illustrations. Sting—Franklin, 1913 : figs. 149, 169, 176 ; Richards, 1927 : fig. 55 ; Tkalců, 1963 : figs. 13–15 ; Hazeltine & Chandler, 1964 : pl. 3. Gastral sternites 7–8—Franklin, 1913 : figs. 111, 113, 128, 135 ; Richards, 1927 : figs. 21, 23 ; Pittioni, 1939a : pl. 3, fig. 1. Genitalia—Franklin, 1913 : figs. 119, 120 ; Richards, 1927 : figs. 15–27 ; Krüger, 1920 : pl. vii t ; Pittioni, 1939a : pl. 3, fig. 1.

HOLARCTIC and parts of S.E. and S.W. ASIA.

## 6. *FRATERNOBOMBUS* Skorikov, 1922

♀. Ocelli separated by two diameters from eyes, lying well in front of postocular line. Frons shining, mostly with rather fine not very close punctures, fine and very close in an area behind the ocelli and coarser and less close in front of them, unpunctured areas large and ill-defined, no distinct band of denser fine punctures along inner margin of eyes. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 10 : 5 : 6½, segment 3 twice as long as broad. Clypeus short, transverse, swollen but rather flattened on ventral third, with large but rather sparse and shallow punctures except on disk below, punctures close and deeper in a large region surrounding the apical impressions which are themselves feeble and ill-defined. Labrum with strongly convex tubercles forming smooth rounded knobs at inner end, furrow deep, a little wider than length of antennal segment 3, lamella strongly curved, half as wide as labrum. Mandibles with no incisura and a strong sulcus obliquus. Malar space very transverse, about as long as antennal segment 5 (= 7). Mid basitarsus with posterior apical angle rounded. Hind tibia with corbicular surface bare, not reticulate, dorsal fringe unusually short and dense, mostly shorter than half apical width of tibia, dorsal inner apical angle long and acute. Gastral tergite 6 granulate with a subapical somewhat flattened shining triangle. Sting with outer thickenings of the sheath narrow and of even width, inner thickenings considerably widened and blackened on lower third, then very narrow, membrane not differentiated. Wings evenly dark fuscous.

♂. Eyes considerably swollen and reaching nearer to occipital margin than usual, ocelli separated by less than ½ diameter from eyes, very far in front of postocular line. Antennae rather long, segments 3 : 4 : 5 : 8 = 9 : 5 : 7 : 8. Mandibles with one broad ventral and one smaller dorsal tooth, beard feeble, very short. Malar space absolutely linear, shorter than antennal segment 2 (= 2½). Mid tibia wide, flattened, longitudinally hollowed out beneath. Mid basitarsus long, parallel-sided (66 × 15), posterior fringe short and dense. Hind tibia convex, mostly densely hairy but with a more posterior streak which is shining, with sparse short hairs, both fringes very short. Hind basitarsus 65 × 17, long, narrow, parallel-sided, distal angle a right angle, fringes short. Gastral sternite 6 flattened with a feeble preapical transverse thickening. Gastral sternite 7 very large, trapeziform, almost quadrate, apex with a deep semicircular emargination covering more than half its width, a wide band of very short dense bristles on each side, no lines or fenestrae. Gastral sternite 8 large, strongly produced, apex with recurved corners and margin weakly trisinuate, a moderate patch of short bristles on each side, two parallel lines on disk posteriorly. Genitalia large and elongate, inner impressions of stipes distinct but rather narrow ; sagittae narrow and not much wider in side view, no tooth beneath, apex hooked inwards and outer side of hook considerably expanded by a flange which is hardly perceptibly serrate ; spatha narrow, hardly wider than sagitta except right at base ; squama rather long, outer and posterior margins forming a continuous curve, inner margin with a strong emargination forming a rather blunt projecting hook at anterior inner end ; lacinia elongate, projecting some way beyond squama, pointed, outer edge raised and thickened, inner edge flattened, thin and approximately straight, irregularly crenate, short haired. Volsella region bare.

Illustrations. Sting—Hazeltine & Chandler, 1964 : pl. 2. Gastral sternites 7 and 8—Franklin, 1913 : figs. 1, 22. Genitalia—Franklin, 1913 : figs. 71, 87.

NORTH and CENTRAL AMERICA.

## 7. *CONFUSIBOMBUS* Ball, 1914

*Sulcobombus* Krüger, 1917
*Confusobombus* Krüger, 1917

♀. Ocelli separated by about two and a half diameters from eyes, lying well in front of postocular line. Frons mostly closely and rather finely punctured, unpunctured areas well-defined, a wide band of close fine punctures along inner margin of eyes. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 11 : 5½ : 5½, segment 3 between three and four times as long as broad. Clypeus moderately elongate, strongly swollen but with a wide flattened disk, closely and finely punctured, even more closely on lower third, apical impressions ill-defined but closely punctured. Labrum with tubercles little raised, much rounded, furrow wide and shallow though not quite so wide as length of antennal segment 3, lamella small, inconspicuous, curved. Mandibles with no incisura, sulcus obliquus moderately strong. Malar space a little longer than broad (= 11), a little longer than antennal segment 3. Mid basitarsus with posterior apical angle rounded. Hind tibia with corbicular surface bare, moderately reticulate, inner dorsal apical angle short but pointed. Gastral tergite 6 moderately shining, finely granulate. Sting with outer thickenings of the sheath rather narrow but a little broader above than below, inner thickenings very narrow, intervening membrane convex above and sending to centre a large blackened lobe on each side. Wings evenly but not strongly infuscate.

♂. Eyes swollen, temples narrow, ocelli separated by rather more than one diameter from eye, far in front of postocular line. Antennae short, segments 3 : 4 : 5 : 8 = 7 : 3½ : 4 : 6. Mandibles with a broad ventral and a small dorsal tooth, beard moderately long and dense. Malar space strongly transverse, shorter than antennal segment 3 (= 5½), almost unpunctured. Mid basitarsus moderately long and parallel-sided (= 42 × 10) posterior fringe about as wide as tarsus. Hind tibia thick and rather clavate, convex, surface punctured and cross-striate with short hairs on its whole surface, fringes long dorsally, mostly short ventrally. Hind basitarsus 37 × 12, moderately broad and narrowed to base, apical dorsal angle rounded, dorsal fringe long, ventral one short. Gastral sternite 6 strongly recurved, a little thickened and emarginate. Gastral sternite 7 crescentic but considerably produced into a rounded triangle, with a band of scattered short bristles well before apex, no lines or fenestrae. Gastral sternite 8 generally crescentic, little produced, feebly truncate, angles rounded, one long black bristle only from a black spot on each side, no lines, two minute oval fenestrae on disk. Genitalia small, pyriform ; stipes very broad with deep sharp-edged impressions covering less than half their width ; sagittae in dorsal view moderately narrow, dorsal half pale on apical half, at mid point with a lateral, somewhat ventral, tooth, beyond this finger-shaped, hardly narrowed, feebly serrate externally, considerably bent down, in side view at least twice as wide as in dorsal view, somewhat narrowing distally ; spatha very wide, at centre five times as wide as sagitta, but strongly narrowing distally ; squama elongate, bent into a V-shaped plate, the spine of the V forming the outer edge, the inner edge having dorsal and ventral plates, spine subacute distally, lower plate with posterior and inner edge rounded together, upper plate with a feeble bilobed process adjacent to stipes ; lacinia long, pointed, inner edge opposite end of squama produced into a stout, backward-curving tooth, outer edge with short stout dense bristles, inner edge with similar but less dense and stout bristles ; volsella region with a moderate number of not very long and stout bristles.

Illustrations. Sting—Hazeltine & Chandler, 1964 : pl. 5. Gastral sternites 7 and 8—Radoszkowsky, 1884 : 42c ; Pittioni, 1939a : pl. 4, fig. 2. Genitalia—Krüger, 1920 : pl. 7, fig. 1 ; Pittioni, 1939a : pl. 4, fig. 2.

EUROPE.

## 8. ***MENDACIBOMBUS*** Skorikov, 1914

♀. Ocelli separated by two and a half diameters from eyes and lying just in front of postocular line. Frons finely and rather closely punctured, unpunctured areas well-defined, of moderate size, a band of fine punctures along inner margin of eyes. Dorsal furrow of gena sometimes feebly indicated. Antennal segments 3 : 4 : 5 = 11 : 4 : 5, segment 3 nearly four times as long as broad. Clypeus very elongate, swollen, feebly punctured, apical impressions feeble and little punctured. Labrum with tubercles little raised, smooth and rounded, gradually narrowed and depressed inwards, furrow very wide and ill-defined, perhaps better described as a transverse furrow both above and below the little raised tubercles, lamella wide, straight. Mandibles with no incisura or sulcus obliquus. Malar space very elongate (= 14), longer than antennal segments 2 + 3. Mid basitarsus with posterior apical angle rounded. Hind tibia with basal half of corbicular surface covered with bristles, bare part densely reticulate, dull, inner dorsal apical angle not produced, hind basitarsus with long bristles on dorsal edge. Gastral tergite 6 shining, moderately closely and strongly punctured. Sting with outer thickenings of sheath very narrow, inner thickening also very narrow, not blackened, membrane undifferentiated. Wings evenly but very little infuscate.

♂. Eyes considerably swollen and reaching back to near the occipital margin, ocelli separated by one diameter from eyes, far in front of postocular line. Antennae rather long, segments 3 : 4 : 5 : 8 = 12½ : 4½ : 6 : 6½, segment 3 at least four times as long as broad. Mandibles rather wider than usual, ending in a single wide tooth only in *B. mendax* Gerstäcker but with a smaller, more dorsal tooth in some Asiatic species, beard long and dense. Malar space very elongate, just shorter than antennal segment 3 (= 11), practically unpunctured. Mid basitarsus moderately long and broad (= 41 × 10), fringes mostly short but a few long bristles near base. Hind tibia slightly convex, rather dull, whole surface covered with not very close short feathered bristles, fringes very long. Hind basitarsus 34 × 15, rather short and broad, dorsal margin with many long hairs, apical dorsal angle rounded-acute. Gastral sternite 6 a little truncate with dense short pale pubescence along apex. Gastral sternite 7 crescentic with a wide produced piece which is about two and a half times as wide at apex as long, sides considerably converging, margin widely membranous, whole surface with scattered, mostly short bristles, no lines or fenestrae. Gastral sternite 8 produced in centre into a large subquadrate piece of which the sides are feebly rounded, apex rather deeply emarginate, surface with dense short bristles, no lines or fenestrae. Genitalia with stipes short and stout with very slight inner impression ; sagittae rather narrow on proximal half, still more so distally where eventually pointed, in side view bisinuate and very little wider, margin weakly crenate a little before apex, apical half on inner side with distinct hairs ; spatha moderately wide, rather more than twice as wide as basal part of sagitta ; squama stout and dark, not produced inwards, in half side view quadrate with rounded angles, a little longer than broad ; lacinia elongate, projecting some way beyond squama, rounded-pointed with inner edge more truncate or a little concave, with stout, curved, rather short bristles on its outer edge ; volsella region bare.

Illustrations. Sting—Text-fig. 8. Gastral sternites 7 and 8—Pittioni, 1939a : pl. 4, fig. 3. Genitalia—Krüger, 1920 : pl. 7, fig. s ; Pittioni, 1939 : pl. 4, fig. 3.

High mountains of EUROPE and ASIA.

## 9. *BOMBIAS* Robertson, 1903

*Nevadensibombus* Skorikov, 1922

♀. Ocelli separated by rather more than two diameters from eyes and lying far in front of postocular line. Frons moderately finely and closely punctured, unpunctured areas large and ill-defined, a band of fine punctures along inner margin of eyes. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 11 : 5 : 6, segment 3 three times as long as broad or rather less. Clypeus elongate, strongly swollen, especially dorsally, finely and evenly punctured, apical impressions feeble and scarcely more punctured. Labrum with tubercles wide and much flattened, furrow ill-defined and shallow but essentially narrow, lamella very wide with a shining thickened edge, surmounted by dense pubescence. Mandibles with no incisura and a feeble sulcus obliquus. Malar space about quadrate (= 12–15), a little longer than antennal segment 3. Mid basitarsus with posterior apical angle rounded. Hind tibia with corbicular surface bare, weakly reticulate, inner dorsal apical angle feebly produced, hind basitarsus with only short pubescence. Gastral tergite 6 finely granulate, rather dull. Sting with outer thickenings of sheath a little wider above than below, inner thickenings rather narrow, of almost even width throughout, edge recurved especially below, membrane undifferentiated except for some lateral blackening below. Wings infuscated.

♂. Rather large, eyes strongly swollen, temples narrow, ocelli separated by one quarter their diameter from eye, very far in front of postocular line. Antennae rather long, segments 3 : 4 : 5 : 8 = 8½ : 4½ : 5 : 5, penultimate segments not curved. Mandibles with a broad ventral and a small dorsal tooth, beard very sparse. Malar space very transverse (= 5), about as long as antennal segment 5, with a few microscopic punctures. Mid basitarsus long and broad (48 × 13), posterior apical angle rounded, dorsal fringe long. Hind tibia considerably clavate, somewhat concave, moderately shining but strongly cross-striate, whole surface with moderately numerous, very short hairs, fringes short. Hind basitarsus (47 × 17), dorsal fringe long, apical dorsal angle rounded. Gastral sternite 6 somewhat depressed with apex recurved, with a dense short fringe. Gastral sternite 7 broadly produced, sides anteriorly diverging, apex truncate, feebly emarginate, angles moderately distinct, a distal patch of very short bristles, no lines or fenestrae. Gastral sternite 8 broadly triangular (no tongue-like projection), apex deeply emarginate and with a U-shaped line defining a still deeper membranous area which is not actually emarginate, two apical patches of short bristles, no other lines or fenestrae. Genitalia with stipes broad at apex, inner impressions hardly developed ; sagittae in dorsal view narrow, a little downcurved, posterior third outwardly feebly serrate, apex more or less pointed (no hooks or flanges), in side view hardly wider, no ventral tooth or emargination ; spatha very wide, five times as wide as sagitta, only narrowing just before its end ; squama large, subquadrate, sloping obliquely downwards laterally, all angles rounded ; lacinia relatively narrow, projecting far beyond the squama, apex subtruncate with a slight hook at inner end, whole surface and outer and inner margin with short, rather dense hairs ; no long bristles in volsellar regions.

Illustrations. Sting—Hazeltine & Chandler, 1964 : pl. 2 ; Franklin, 1913 : fig. 151. Gastral sternites 7 and 8—Franklin, 1913 : figs. 100, 124, 136, 139. Genitalia—Franklin, 1913 : figs. 73, 82, 83.

N. AMERICA.

## 10. ***SEPARATOBOMBUS*** Frison, 1927

♀. Ocelli separated by two diameters or rather less from eyes and lying well in front of postocular line. Frons rather strongly and closely punctured, unpunctured areas small and well-defined, a band of fine punctures along inner margin of eyes. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 9 : 4½ : 5½, segment 3 twice as long as broad. Clypeus rather long and swollen, finely and moderately closely punctured, apical impressions feeble, more closely punctured. Labrum with tubercles, flattened, angled at inner end, furrow wide and deep, nearly as wide as length of antennal segment 3, lamella wide, curved. Mandibles with no incisura but with a strong sulcus obliquus. Malar space short and transverse (= 8), shorter than antennal segment 3. Mid basitarsus with posterior apical angle rounded. Hind tibia with corbicular surface bare, distinctly reticulate, inner dorsal apical angle distinctly but not strongly produced, hind basitarsus with only short pubescence. Gastral tergite 6 shining, feebly granulate. Sting with outer thickenings of sheath moderately wide both above and below, inner thickenings rather strongly widened on lower third, then narrowed in a smooth curve and thence upwards of an even width, a little blackened where it narrows, membrane projecting above and produced downwards on each side into an elongate-oval lobe which is blackened at the end. Wings infuscate at tip or throughout.

♂. Rather large, eyes swollen, temples rather narrow, ocelli separated by two thirds their diameter from eyes, far in front of the postocular line. Antennae rather long, segments 3 : 4 : 5 : 8 = 7½ : 5½ : 7 : 7½, penultimate segments scarcely curved. Mandibles with a broad ventral and small dorsal tooth, beard long and dense. Malar space very short and transverse (= 3½), hardly longer than antennal segment 2, shorter than 4, hardly punctured. Mid basitarsus long and parallel-sided (45 × 9½), posterior apical angle rounded, fringes short. Hind tibia not very convex, dull and alutaceous, large disk almost completely bare, dorsal fringe long. Hind basitarsus (42 × 10) dorsal fringe long, fully twice as long as tibial width, apical dorsal angle a rounded right angle. Gastral sternite 6 with apex a little thickened, not recurved, with short dense postapical fringe. Gastral sternite 7 trapeziform, apex very feebly emarginate, corners rounded but slightly projecting, a large area of short dense bristles, no lines or fenestrae. Gastral sternite 8 subtriangularly produced, sides strongly converging, apex a little rounded, almost pointed, a large area of dense, short bristles, with two parallel lines which meet at centre and then proceed back as one line, no fenestrae. Genitalia rather broad, stipes with wide but very poorly defined impressions ; sagittae in dorsal view narrow, apex curved downwards, widely hooked inwards, tip of hook not really acute and its outer edge with a slight flange, in side view about twice as wide, with no ventral tooth or emargination, spatha small, sides strongly converging, at its centre two and a half times as wide as sagitta ; squama small, transverse, rounded-triangular, with a small inner process separated by a shallow emargination where it joins the stipes ; lacinia short, only just projecting beyond the squama, with an acute outer angle and a moderate inner curved hook ; volsella region with dense, short, bristles.

Illustrations. Sting—Hazeltine & Chandler, 1964 : pl. 2. Gastral sternites 7 and 8—Franklin, 1913 : figs. 31, 127, 129, 134. Genitalia—Franklin, 1913 : figs. 85, 86, 89, 90.

N. AMERICA.

## 11. ***CROTCHIIBOMBUS*** Franklin, 1954

♀. Ocelli separated by somewhat less than two diameters from eyes, lying well in front of postocular line. Frons rather sparsely punctured in region of ocelli except for a densely punctured quadrate area immediately behind them, unpunctured areas very ill-defined, a number of very fine but not very close punctures between them and the eyes, nearer the latter. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 10 : 6 : 6½, segment 3 just longer than twice as long as broad. Clypeus short, rather strongly swollen, with not very close but general punctures, mostly rather small but some large, apical impressions strong, very closely punctured. Labrum with tubercles moderately convex, laterally flattened, inner end angled, furrow deep but narrower than length of antennal segment 3, lamella curved, moderately broad. Mandibles with a feeble incisura and a rather weak sulcus obliquus. Malar space transverse (= 9), a little shorter than antennal segment 3. Mid basitarsus with posterior apical angle feebly angled. Hind tibia with corbicular surface bare, feebly reticulate, corbicular hairs not short and dense as in *B. fraternus* (Smith), inner dorsal apical angle strongly produced, hind basitarsus with short pubescence. Gaster with pubescence short but not closely appressed as in *Fraternobombus*, tergite 6 moderately shining and coarsely rugose. Sting with outer thickenings rather wide but somewhat narrow in centre, inner thickenings widening for a short distance below, but then rather suddenly narrowing again and remaining of even width to dorsal end, lower part considerably darkened, intervening membrane apparently not differentiated but a blackened convex area near the narrowing of the inner thickenings. Wings evenly infuscate.

♂. Rather large, eyes large and swollen, ocelli separated by half a diameter from eyes, lying far in front of postocular line. Antennae long, segments 3 : 4 : 5 : 8 = 8½ : 6½ : 9½ : 9. Mandibles with a broad ventral and small dorsal tooth, beard long and dense. Malar space very short and transverse (= 5), shorter than antennal segment 4, not punctured. Mid basitarsus very long and narrow (52 × 9), posterior apical angle rounded, fringes short. Hind tibia narrow, especially at base, gently convex, shining, with sparse short hairs throughout, dorsal fringe rather sparse but nearly as long as apical width of tibia. Hind basitarsus (52 × 13), dorsal apical angle a rounded right angle, dorsal fringe not dense but nearly twice as long as its width. Gastral sternite 6 a little thickened but not reflexed subapically, thickening truncate in centre, a short dense subapical fringe. Gastral sternite 7 in the form of a wide, curved, transverse band, fore and hind margins nearly parallel, a large patch of short dense bristles on each side, no lines or fenestrae. Gastral sternite 8 a narrow band, strongly produced into a tongue-shaped process, sides slightly convergent, angles rounded, apex approximately straight, most of surface with dense, short bristles, two parallel lines and a small, subapical fenestra. Genitalia large, stipes rather long and broad with a wide, well-defined, inner impression. Sagitta narrow, slightly less so in side view, no ventral tooth, end hooked inwards, end of hook narrow and pointed, whole hook elongate, outer side with a slight flange which does not end anteriorly in a tooth. Spatha broad, sides very rapidly converging, at mid point three times as wide as sagitta. Squama rounded triangular, moderately large, with a small antero-internal process separated from the rest by a narrow emargination, process wide in the transversely dorso-ventral plane. Lacinia not much projecting beyond the squama, curved, parallel-sided, end emarginate, outer angle produced into a small acute point, inner angle forming a small hook, somewhat widened in dorso-ventral plane. No dense bristles on lacinia or volsellar region.

Illustrations. Sting—Hazeltine & Chandler, 1964 : pl. 2. Gastral sternites 7 and 8—Franklin, 1913 : figs. 117, 130. Genitalia—Franklin, 1913 : figs. 81, 88.

WESTERN U.S.A., MEXICO.

## 12. *SIBIRICOBOMBUS* Vogt, 1911

*Obertobombus* Reinig, 1930

♀. Ocelli separated by two diameters from eyes or rarely fully two and a half diameters, lying well in front of postocular line. Frons closely and rather finely punctured, unpunctured areas small and well-defined, a wide band of fine sculpture along inner margin of eyes. Dorsal furrow of gena sometimes weakly developed. Antennal segments 3 : 4 : 5 = 10½ : 4½ : 5, segment 3 about four times as long as broad. Clypeus elongate, strongly swollen, rather closely punctured, even more so in the well-marked apical impressions. Labrum with tubercles rather small and convex, furrow not wide, much narrower than length of antennal segment 3, lamella nearly straight. Mandibles with no incisura and a well-marked sulcus obliquus. Malar space very elongate (= 17), longer than antennal segments 2 + 3, with many fine punctures. Mid basitarsus with posterior apical angle somewhat produced. Hind tibia with corbicular surface bare, feebly reticulate, inner dorsal apical angle rather weakly produced, hind basitarsus with short pubescence, dorsal apical angle almost spinose, auricle covered with dense short hairs. Gastral tergite 6 rather strongly granulate, usually dull. Sting with outer thickenings of the sheath narrow, rarely a little widened above, inner thickenings very little widened below, a little blackened near centre in an adjacent membranous lobe, membrane also brown and convex in a small dorsal area. Wings evenly but not strongly infuscate.

♂. Eyes normally large and swollen with temples narrow, but unmodified in *B. sibiricus* (Fabricius), when enlarged ocelli lying far in front of postocular line ; ocelli separated normally by one diameter from eyes, but by two and a half diameters in *B. sibiricus* (Fabricius). Antennae very long, 3 : 4 : 5 : 8 = about 9 : 5½ : 8½ : 9 or in *B. sibiricus* (Fabricius) 7 : 5 : 9½ : 9½, penultimate segments nearly straight. Mandibles with a broad ventral and a small dorsal tooth, beard pale, dense but rather short. Malar space much longer than broad (= *c*. 9), longer than antennal segments 2 + 3, with many fine punctures. Mid basitarsus very long and parallel-sided (38 × 8), posterior apical angle acute, fringes very short. Hind tibia not very elongate, strongly convex (less so in *B. sibiricus* (Fabricius) ), hairy, the hairs arising from granulate punctures, dorsal fringe very long. Hind basitarsus (40 × 12) dorsal apical angle acute, dorsal fringe long. Gaster with short not very close hairs, not very closely punctured or reticulate. Gastral sternite 6 little modified but usually distinctly emarginate (not in *B. obtusus* Richards). Gastral sternite 7 rounded rectangular with apex widely straight truncate, with considerable area of fine short hairs, no lines or fenestrae. Gastral sternite 8 produced but sides of production strongly converging posteriorly, with a small truncate apex and an apical tuft of longish bristles, no fenestrae, lines absent or feebly developed at base. Genitalia elongate, rather large ; stipes with a strong (in *B. sibiricus* (Fabricius) weaker) sharp-edged inner impression, half its width ; sagitta narrow, dorsal half submembranous, strongly bent down at apex where hooked inwards, hook very long and pointed, no real outer flange, sagitta in side view much wider but gradually narrowing to apex, no ventral tooth or emargination ; spatha fully twice as wide as sagitta, almost parallel-sided ; squama rather long, outer and posterior edges forming a continuous curve, inner edge with a deep oval emargination leaving a wide, rounded, posterior, inner process and a narrow, acute, anterior one ; lacinia projecting some way beyond squama, considerably narrowed and curved inwards towards apex which is truncate with inner corner forming a slight hook, apex and outer edge with dense short bristles ; volsellar region with very dense, moderately long, stout bristles.

Illustrations. Sting—Text-fig. 9. Gastral sternites 7 and 8—Radoszkowski, 1884 : figs. 44c, 44d ; Pittioni, 1939a : pl. 4, fig. 1. Genitalia—Pittioni, 1939a : pl. 4, fig. 1.

EASTERN EUROPE to northern ASIA and mountains of S. ASIA.

## 13. *CULLUMANOBOMBUS* Vogt, 1911

*Rufocinctobombus* Frison, 1927

♀. Ocelli separated by rather less than three or (*B. rufocinctus* Cresson) rather more than two diameters from eyes, lying well in front of postocular line. Frons closely and rather finely punctured, unpunctured areas small and well-defined, a wide band of fine punctures along inner margin of eyes. Dorsal furrow of gena sometimes developed. Antennal segments 3 : 4 : 5 = 8 : 5 : 5½ (or *B. rufocinctus* Cresson 8 : 4½ : 4½), segment 3 about twice as long as broad. Clypeus rather swollen, rather closely and evenly punctured or (*B. rufocinctus* Cresson) shining and sparsely and more coarsely punctured, apical impressions rather deep or (*rufocinctus*) small and shallow. Labrum with tubercles rather small and flattened, somewhat angled at inner end, furrow rather narrower than length of antennal segment 3, lamella short and curved. Mandibles with no incisura but with a more or less well-marked sulcus obliquus. Malar space just transverse (= 9), a little longer than antennal segment 3 or (*B. rufocinctus* Cresson) distinctly transverse and clearly shorter than segment 3. Mid basitarsus with posterior apical angle rounded. Hind tibia with corbicular surface bare, finely or (*B.

*rufocinctus* Cresson) more strongly reticulate, inner dorsal apical angle produced but not strongly so, hind basitarsus with short, not very dense pubescence, dorsal edge strongly curved (except *B. rufocinctus* Cresson). Gastral tergite 6 dull, granulate and sparsely punctured with traces of a longitudinal furrow. Sting with outer thickenings of sheath considerably widened above, inner thickenings rather strongly widened and somewhat blackened below, two small blackened areas in membrane just above the widening, no other folds in membrane. Wings with apex darkened.

♂. Eyes scarcely or (*B. rufocinctus* Cresson) more distinctly enlarged, ocelli separated by two and a quarter diameters from eyes or (*B. rufocinctus* Cresson) rather less than two diameters, just in front or well in front of postocular line. Antennae moderately long, segments 3 : 4 : 5 : 8 = 6 : 4½ : 7½ : 7½ (in *B. rufocinctus* Cresson segment 3 nearly as long as 5), penultimate segments straight. Mandibles with a broad ventral and small dorsal tooth, beard dense but not very long. Malar space just transverse (= 5), about as long as antennal segment 3, with numerous fine punctures. Mid basitarsus moderately long and parallel-sided (= 38 × 9), posterior apical angle a rounded right angle, fringes short. Hind tibia moderately clavate, disk convex, shining, mostly bare, with small coarse, scale-like cross-striation, dorsal fringe long but not dense. Hind basitarsus (38½ × 11) with dorsal apical angle rounded but rarely acute, fringes short or (*B. rufocinctus* Cresson) dorsal fringe long. Gaster with dense, relatively short hairs. Gastral sternite 6 with its apex somewhat truncate and thickened at the angles. Gastral sternite 7 widely crescentic, apical margin rounded with scattered short, coarse bristles, apical disk with an area of close fine ones, no lines or fenestrae. Gastral sternite 8 triangularly produced, sides not at all parallel, apex somewhat pointed, with a small area of dense, short hairs, no fenestra, two parallel lines on disk. Genitalia rather long but not wide ; stipes with inner impressions feebly indicated ; sagittae narrow, curved down at end where hooked inwards, actual tip of hook a little pointed, no real flange, in side view equally narrow, not widening even at base, no ventral tooth ; spatha narrow, hardly widened at base, at centre hardly wider than sagitta ; squama transverse though not strongly so, externally more or less rounded, distal end feebly emarginate, inner side produced into a strong but not very acute posterior point and a very short anterior tubercle, inner margin generally straight-oblique ; lacinia projecting far beyond squama, narrow and parallel-sided, curving a little inwards, apex pointed, obliquely truncate, a little before apex with close short bristles on both inner and outer side ; volsellar region with a group of dense, long bristles.

Illustrations. Sting—Richards, 1927 : fig. 57 ; Hazeltine and Chandler, 1964 : pl. 2. Gastral sternites 7 and 8—Franklin, 1913 : 55, 122 ; Pittioni, 1939a : pl. 3, fig. 6. Genitalia—Krüger, 1920 : fig. 60 ; Franklin, 1913 : figs. 79, 84 ; Richards, 1927 : fig. 36 ; Pittioni, 1939a : pl. 3, fig. 6.

EUROPE, N. ASIA, N. AMERICA, northern CENTRAL AMERICA.

## 14. ***PYROBOMBUS*** von Dalla Torre, 1880

*Pyrrhobombus* von Dalla Torre, 1882
*Poecilobombus* von Dalla Torre, 1882
*Pratobombus* Vogt, 1911
*Hypnorobombus* Q. Pérez, 1927
*Lapponicobombus* Q. Pérez, 1927

This large subgenus includes species which vary much more than usual in the length of the malar space ; there is also some variation in the structure of the male genitalia. Nevertheless it scarcely seems practical at present to subdivide the group.

♀. Ocelli separated by nearly three diameters from eyes, lying just in front of postocular line. Frons mostly shining and rather sparsely punctured, in species such as *B. atrocinctus*

Smith with much dense, short, velvety pile, unpunctured areas large and ill-defined, no band of fine punctures along inner margin of eyes. Dorsal furrow of gena always indicated, sometimes quite strong. Antennal segments 3 : 4 : 5 about = 7 : 4 : 5½, or, *B. atrocinctus* Smith, 7½ : 6 : 6½, segment 3 hardly twice as long as broad. Clypeus typically moderately long and swollen, largely unpunctured, with characteristic deep, well-marked apical impressions containing many large punctures, in *B. atrocinctus* Smith these impressions weak and hardly punctured. Labrum with tubercles rather flattened, furrow very narrow, narrower than length of antennal segment 3, lamella usually short and strongly curved, wider and less curved in *B. impatiens* Cresson. Mandibles usually with a well-marked incisura, no sulcus obliquus. Malar space variable, from just longer than broad and a little longer than antennal segment 3, to clearly transverse and hardly as long as 3, length varying between 8 and 12 units, not punctured. Mid basitarsus with posterior apical angle rounded. Hind tibia with corbicular surface bare, shining or moderately reticulate, inner dorsal apical angle feebly or not produced (except *B. atrocinctus* Smith), hind basitarsus with short pubescence. Gastral tergite 6 shining, finely rather sparsely punctured or granulate. Sting with outer thickenings of the sheath narrow but considerably widened for a short distance dorsally, inner thickenings narrow and not much widened below, membrane undifferentiated except for two black central spots (copulation scars) in copulated specimens. Wings rather evenly but usually not much darkened.

♂. Typically rather small. Eyes not at all swollen, ocelli separated by at least three diameters from eyes, lying about on the postocular line. Antennae not very long, segments 3 : 4 : 5 : 8 = 6 : 5 : 6½ : 6½, or (*B. atrocinctus* Smith) segment 5 a little longer (7½), penultimate segments straight. Mandibles with a large ventral and small dorsal tooth, beard long and dense. Malar space variable as in the ♀, from as long as antennal segments 2 + 3 (or shorter) to as long as segments 3 + 4, usually with scattered fine punctures. Mid basitarsus long and parallel-sided (32 × 7), still longer in *B. atrocinctus* Smith (= 46 × 9), fringes short. Hind tibia moderately convex, surface moderately shining, with long hairs except on distal third where they are short, fringes long. Hind basitarsus (= 33 × 9) apical angle subacute, fringes short. Gastral sternite 6 not recurved and hardly thickened at apex, postapical fringe short and inconspicuous. Gastral sternite 7 crescentic, not at all produced, with two almost joined groups of bristles which are longer on each side, no lines or fenestrae. Gastral sternite 8 strongly produced into a subquadrate plate, sides parallel, apex feebly emarginate, angles rounded, most of surface covered with short bristles, no lines or fenestrae ; in *B. atrocinctus* Smith the produced part is narrower, with its sides more converging posteriorly, the end forming a rounded point. Genitalia typically rather short, not much longer than broad (relatively larger and longer in *B. atrocinctus* Smith) ; stipes rather narrow with effectively no inner impressions ; sagittae narrow, bent downwards apically in a rounded right-angle, hooked inwards without broad flanges, in side view somewhat wider, emarginate beneath near base, with a small tooth at the end of emargination ; in *B. atrocinctus* Smith the hook is longer with its outer edge straighter ; squama very small and subtriangular, mostly in a transverse dorso-ventral plane, with a distinct anterior inner process in *B. atrocinctus* Smith. Lacinia typically very small and entirely hidden by the squama but much longer and projecting well beyond it in *B. atrocinctus* Smith, parallel-sided, apex slightly emarginate or with a strong, curved, inner hook in *B. atrocinctus* Smith ; volsellar region normally almost bare but with long dense bristles in *B. atrocinctus* Smith.

Illustrations. Sting—Franklin, 1913 : fig. 172 ; Richards, 1927 : fig. 58 ; Hazeltine & Chandler, 1964 : pl. 4. Gastral sternites 7 and 8—Radoszkowski, 1884 : fig. 2c ; Franklin, 1913 : figs. 105, 125, 131, 133, 137, 140, 142, 144, 145 ; Frison, 1925 : pl. 1, figs. 2, 3 ; Frison, 1934 : figs. 5c, d, 6c, d ; Pittioni, 1939a : pl. 3, fig. 4. Genitalia—Radoszkowsky, 1884 : figs. 2a, b ; Franklin, 1913 : figs. 64, 65, 67, 190 ; Frison, 1925 : pl. 1, fig. 1 ; Richards, 1927 : fig. 37 ; Frison, 1934 : figs. 5a, 6a ; Krüger, 1920 : pl. 6, fig. p ; Pittioni, 1939a : pl. 3, fig. 4.

EUROPE, ASIA (including Burma and " Indo-China " and East Indies), N. AMERICA, C. AMERICA.

## 15. *MELANOBOMBUS* von Dalla Torre, 1880

*Lapidariobombus* Vogt, 1911
*Kozlovibombus* Skorikov, 1922
*Tanguticobombus* Pittioni, 1939b

This is another large and varied subgenus. The tip of the gaster almost always has red hairs (except most specimens of *B. flavothoracicus* Bingham). The malar space is normally a little longer than broad but markedly so in *B. simillimus* Smith of which the male is unknown. The labrum and other characters of *B. tanguticus* Morawitz are somewhat abnormal but there seems no reason to place it in a separate subgenus, at least until the male is known. *B. rufofasciatus* Smith and its allies have the eyes more or less enlarged with the ocelli approximated to them and the inner side of the squama more strongly emarginate than usual ; nevertheless it does not seem that the group is well enough marked to be treated as a distinct subgenus.

♀. Ocelli normally separated by nearly three diameters from eye and lying just in front of postocular line but in some species separated by not much more than two diameters and lying well in front of postocular line. Frons with some large and many fine punctures, unpunctured areas rather small and well-defined (larger and ill-defined in *B. tanguticus* Morowitz), a well-marked wide band of fine punctures along inner margin of eye, this band almost ceasing behind the level of the mid-point of the ocelli in *B. rufofasciatus* etc. Dorsal furrow of gena usually more or less indicated, absent only in *B. incertus* Morawitz. Antennal segments 3 : 4 : 5 = 8 : 5½ : 6, segment 3 twice as long as broad. Clypeus long (shorter in *B. tanguticus*), rather flattened (more convex in *B. rufofasciaticus*), rather finely punctured (more punctured in *B. tanguticus* and *B. rufofasciatus*, and in the first-named the punctures coarser), apical impressions feeble and not strongly punctured except in *B. tanguticus*. Labrum with tubercles not much flattened and rather dull, more angular inwardly in *B. tanguticus*, furrow broad, wider than length of antennal segment 5, or deep and narrower and hardly as wide as antennal segments in *B. tanguticus*, lamella moderately wide, little curved. Mandibles typically with no incisura and a well-marked sulcus obliquus weak or absent in *B. tanguticus*, *B. rufofasciatus* and *B. keriensis tenellus* Friese. Malar space a little longer than broad (= 10), a little longer than antennal segment 3, but somewhat longer in *B. rufofasciatus* (as long as antennal segments 2 + 3), or considerably more elongate in *B. simillimus* and *B. flavofasciatus* Bingham. Mid basitarsus with posterior apical angle rounded or in *B. tanguticus* distinctly angled. Hind tibia with corbicular surface usually bare exceptionally with some short hairs (*B. simillimus*, *B. tanguticus*), finely reticulate inner dorsal apical angle not at all or very little produced. Hind basitarsus with short pubescence, on surface usually dense except in *B. tanguticus*. Gastral tergite 6 with a raised, more or less rounded, sometimes furrowed, largely bare boss, apex in *B. rufofasciatus* somewhat truncate and emarginate, or in *B. tanguticus* distinctly emarginate. Sting with outer thickenings of the sheath narrow except at extreme dorsal end, inner thickenings narrow, a little widened on lower third and then narrowed again, not blackened except rather extensively in *B. simillimus*, or in *B. tanguticus* with whole inner thickenings wider and margin medially quite widely reflexed and dorsally shortly blackened, intervening membrane very little blackened laterally or more extensively so in *B. simillimus*. Wings typically not at all darkened, even at the tip, but dark throughout in *B. simillimus*.

♂. Typically a good deal smaller than ♀. Eyes not enlarged and ocelli separated by three diameters from eyes and lying just in front of postocular line or (*B. rufofasciatus*, etc.) eyes more or less distinctly swollen (most in *B. oculatus* Frison) ocelli separated by about two diameters or less from eyes and lying more or less strongly in front of postocular line. Antennae moderately long, segments 3 : 4 : 5 : 8 = about 7 : 4 : 6 : 5½, penultimate segments straight.

Mandibles with a large ventral and small dorsal tooth, beard long and dense. Malar space about quadrate (= 7), not quite as long as antennal segments 2 + 3, with some fine, scattered punctures. Mid basitarsus rather long, a little convergent at each end (40 × 9, or *B. rufofasciatus* 51 × 11), with long hairs on proximal half of dorsal edge and some on disk. Hind tibia distinctly convex, dull and reticulate, most of surface with rather sparse, moderately long hairs but a considerable bare disk on apical half (absent in *B. rufofasciatus*) fringes very long. Hind basitarsus (= 41 × 11 or *B. rufofasciatus* 50 × 13), apical angle a rounded right angle or *B. rufofasciatus*, subacute, dorsal margin with some long hairs. Gastral sternite 6 a little produced, thickened and recurved on central half and here a little emarginate. Gastral sternite 7 crescentic with centre of hind margin truncate or emarginate (rather more produced in *B. rufofasciatus*) with a large transverse patch of short bristles, no lines or fenestrae. Gastral sternite 8 not much produced posteriorly, broadly subtriangular, somewhat truncate or emarginate at apex, angles of truncation rounded, two small patches of bristles on each side, a few of the bristles long, no fenestrae but one central line. Genitalia relatively long and narrow ; stipes narrow with no or with weak inner impressions ; sagittae narrow in both dorsal and lateral views, no tooth or emargination beneath, end bent downwards and hooked inwards, but the hook angular and pointed like a half arrowhead ; spatha long and narrow, sides feebly converging, in centre twice as wide as sagitta ; squama small, not quite quadrate, rounded-transverse, with small rounded proximal inner projection, or (*B. rufofasciatus*) squama smaller with posterior vertically truncate and smaller broadly triangular proximal inner lobes ; lacinia long, projecting some way beyond squama, curved, parallel-sided, and truncate or emarginate so that there are two weak angles, in *B. rufofasciatus* the inner one forming a curved hook ; volsellar region with no conspicuous bristles.

Illustrations. Sting—Richards, 1927 : fig. 36 [figure on pl. 6 of Hazeltine & Chandler, 1964 seems to be some wrongly determined species]. Gastral sternites 7 and 8—Pittioni, 1939a : pl. 3, fig. 3 ; Frison, 1933 : figs. 3e, f ; Frison, 1934 : figs. 4e, d. Genitalia—Krüger, 1920 : pl. 6, fig. n ; Richards, 1927 : fig. 35 ; Frison, 1933 : fig. 3c ; Frison, 1934 : fig. 4a.

EURASIA.

## 16. ***PRESSIBOMBUS*** Frison, 1935

♀. Ocelli separated by nearly three diameters from eyes, lying just in front of postocular line. Frons not very closely or coarsely punctured, part behind ocelli at sides with very close fine punctures, temples also with very close, fine punctures, unpunctured areas ill-defined and not large, no band of fine sculpture along inner margin of eyes, much of head with dense, feathery hairs. Dorsal furrow of gena very weak. Antennal segments 3 : 4 : 5 = 8½ : 5 : 6½, segment 3 about two and a half times as long as broad. Clypeus moderately elongate, little swollen, with fairly numerous scattered punctures, mostly small but a few large, apical impressions well-defined with a few large punctures. Labrum with tubercles angularly raised towards inner end where they fall sharply on lower half (less so near clypeus), surface shining with large shallow punctures, furrow rather wide and shallow, at least as wide as length of antennal segment 3, lamella very inconspicuous, rather short, feebly curved. Mandibles with a feeble incisura and no sulcus obliquus. Malar space about quadrate (= 13), about as long as antennal segments 2 + 3, not punctured. Mid basitarsus with posterior apical angle obtuse. Hind tibia with corbicular surface bare, rather weakly reticulate, inner dorsal apical angle moderately produced. Hind basitarsus densely pubescent, lower edge for its whole length and part of adjacent disk with long bristles. Gastral tergite 6 slight truncate, with raised boss. Sting with outer thickenings of the sheath not wide, but wider above than below, inner thickenings wide, widest just above the middle, edge forming a smooth curve, considerably blackened, especially near middle, membrane darkened at extreme dorsal end, otherwise undifferentiated. Wings moderately, evenly, infuscate.

♂. Relatively small. Eyes not swollen, temples wide with dense feathered pubescence, ocelli separated by three diameters from eyes, lying on postocular line. Antennae moderately long, segments 3 : 4 : 5 : 8 = 7 : 4 : 5½ : 6, penultimate segments straight. Mandibles with large ventral and small dorsal apical teeth, beard long, dense, pale. Malar space elongate (= 9½), as long as antennal segments 2 + 3, not punctured. Mid basitarsus (35 × 6½) long, narrow, parallel-sided, posterior apical angle a rounded right angle, a few long bristles in dorsal fringe. Hind tibia feebly convex, strongly shining, disk bare, fringes very long but rather sparse. Hind basitarsus (= 37 × 10), rather long and narrowed to base, dorsal apical angle subacute, dorsal fringe long but sparse. Gastral sternite 6 with apex a little recurved and truncate. Gastral sternite 7 unusually strongly produced, apex feebly curved, a large patch of short, black-based bristles and a group of long feathered hairs on each side, no lines or fenestra ; gastral sternite 8 considerably produced, sides nearly parallel but somewhat converging posteriorly, apex truncate, angles quite well-marked, a large patch of short bristles, two parallel lines joining at centre and proceeding backwards as one, between them a transparent area, almost forming a fenestra. Genitalia relatively large ; stipes with a broad, sharp-edged inner impression ; sagitta in dorsal view wide at base, narrow after middle, apex moderately bent down, feebly hooked inwards with a small, sharp flange, externally with a much larger acute flange, in side view wide at base then somewhat emarginate, then widened again and then narrowing to apex though still relatively wide, no ventral tooth ; spatha wide, little narrowed posteriorly, nearly twice as wide as sagitta, acutely produced between basal inner processes of stipes ; squama very unusual in that it is completely fused to the stipes, represented by a long, narrow, acute process, directed obliquely backwards and inwards ; lacinia rather elongate, twisted so that in dorsal view it appears very narrow, apically, from side apex is obliquely truncate with dense rather short bristles at tip and along whole inner edge ; volsellar region with short moderately dense hairs.

Illustrations. Sting—Text-fig. 10. Gastral tergites 7 and 8—Frison, 1935 : figs. 1e, f. Genitalia—Frison, 1935 : fig. 1b.

HIMALAYAS.

## 17. *RUFIPEDIBOMBUS* Skorikov, 1922

Very large species. ♀. Ocelli separated by three diameters from eyes somewhat in front of postocular line. Frons not much punctured, punctures fine, particularly in front of and at sides of ocelli, unpunctured area large and ill-defined, some fine punctures along inner margin of eyes, much of head with dense velvety hairs as well as bristles. Dorsal furrow of gena more or less developed. Antennal segments 3 : 4 : 5 = 11 : 8 : 9, segment 3 not three times but more than twice as long as broad. Clypeus moderately long, swollen, irregularly and not very closely or coarsely punctured, apical impressions deep but not closely punctured. Labrum with tubercle strongly angled at inner end, furrow moderately distinct, about as wide as length of antennal segment 3, lamella wide, little curved. Mandibles with a weak or no incisura, no sulcus obliquus. Malar space distinctly longer than broad (= 16), nearly as long as antennal segments 4 + 5, feebly punctured ventrally. Mid basitarsus with apical dorsal corner not angled. Hind tibia with corbicular surface not reticulate, typically with sparse, short feathered hairs, dorsal corbicular fringe very dense, dorsal inner apical angle acutely produced. Hind basitarsus not densely pubescent. Gastral tergite 6 variable, finely or coarsely granulate, apical half keeled, swollen or hollowed out. Sting with outer thickenings of the sheath very narrow, more or less distinctly widened above, inner thickenings considerably widened below to just above the middle then narrowed again, edge considerably blackened, just inside this on each side a very strong, shining, convex fold of the membrane. Wings evenly yellowish or infuscate, or darker at tip.

♂. Large but much smaller than ♀. Eyes not swollen, ocelli separated by two and a half diameters from eyes, just in front of postocular line. Antennae very long, segments 3 : 4 : 5 : 8 = 7½ : 6½ : 10 : 10, penultimate segments straight. Mandibles with a broad ventral and a small dorsal tooth, beard long and dense. Malar space distinctly longer than broad (= 12), a little longer than 2 + 3 but shorter than 3 + 4, almost unpunctured. Mid basitarsus (=

48 × 11), long and parallel-sided, posterior apical angle rounded, posterior fringe nearly as long as its width. Hind tibia not very clavate, flat, shining, with numerous, quite long, feathered hairs, fringes long and dense, especially the dorsal one. Hind basitarsus (= 54 × 14) parallel-sided, relatively broad, posterior dorsal angle a rounded right-angle, fringes short. Gaster with dense, moderately short hairs, tergites closely and rather strongly punctured and strongly reticulate. Gastral sternite 6 smooth and shining, central third produced into rounded lobe which is a little thickened and reflexed. Gastral sternite 7 widely crescentic, apex shallowly curved, with two small groups of short bristles, no lines or fenestrae. Gastral sternite 8 very transverse, little produced and produced part wide, feebly emarginate at apex, a small apical group of bristles, disk with a bi-emarginate thickening. Genitalia with inner impressions of stipes large but ill-defined, inner side with a large, pale membranous band, sagitta in dorsal view relatively narrow, dorsal half pale and submembranous, lower half darker sclerotised, apex bent down and hooked inwards, hook not very long but moderately sharp with a wide outer flange on the bend, in side view it is very wide at base but narrows regularly towards the apex, with no ventral tooth or emargination, except a slight projection at the base of the flange ; spatha almost quite parallel-sided, a little wider than sagitta ; squama small, almost entirely developed on the inner side of stipes in an S-like curve with its inner end forming a small backwardly directed hook ; lacinia projecting far beyond the squama, broad at base with a central membranous area, narrowing to apex which is roundly pointed but sometimes irregular, almost bare, tips of lacinia tending to curve inwards and almost meeting ; volsellar region entirely without bristles.

Illustrations. Sting—Text-fig. 11. Gastral sternites 7 and 8—Frison, 1930 : figs. 6, 7 ; Frison, 1934 : figs. 3c, d. Genitalia—Frison, 1930 : fig. 5 ; Frison, 1934 : fig. 3a.

S.W. CHINA, HIMALAYAS, FORMOSA [TAIWAN], EAST INDIES.

*Bombus festivus* Smith, of which the male and worker have been unknown, seems now almost certainly to belong to *Pyrobombus* (= *B. atrocinctus* Smith) von Dalla Torre.

## 18. *ALPINOBOMBUS* Skorikov, 1914

Large species. ♀. Ocelli separated by three diameters from eyes, lying just in front of or on the postocular line. Frons rather feebly punctured, especially behind the level of the ocelli laterally, unpunctured areas ill-defined, a rather broad band of very fine sculpture along inner margin of eyes. Dorsal furrow of gena distinct. Antennal segments 3 : 4 : 5 = 9 : 6 : 7 or 8 : 5 : 6, segment 3 twice as long as broad or slightly less. Clypeus moderately long and swollen, generally but not very coarsely punctured, apical impressions rather strong, strongly and closely or rather closely punctured. Labrum with tubercles flattened, not much angled at inner ends, furrow narrow, narrower than length of antennal segment 3, lamella short, curved, inconspicuous. Mandibles with no incisura and a weak sulcus obliquus. Malar space longer than broad, longest in *B. hyperboreus* Schönherr (= 16), as long as antennal segments 3 + 4, shortest in *B. arcticus* Kirby (= 12), as long as antennal segments 2 + 3. Mid basitarsus with apical dorsal angle a rounded right angle. Hind tibia with corbicular surface bare, hardly reticulate, dorsal inner apical angle shortly and broadly produced. Hind basitarsus not densely pubescent. Gastral tergite 6 moderately shining, granulate, sometimes coarsely. Sting with outer thicknenings moderately wide, especially above, inner thickenings greatly widened below, with two isolated blackened spots (sometimes fused), in the membrane between them. Wings if somewhat infuscate, evenly so.

♂. Relatively large. Eyes not swollen, ocelli separated by three diameters from eyes, lying on postocular line. Antennae moderately long, segments 3 : 4 : 5 : 8 = 6½ : 4½ : 8 : 8, penultimate segments straight. Mandibles with one broad ventral and one small dorsal tooth, beard long and dense. Malar space (= *c.* 9) about quadrate, a little longer than 2 + 3 but shorter than 3 + 4, with scattered fine punctures. Mid basitarsus (= 38 × 11) moderately long, rather broad, somewhat narrowed at base, posterior apical angle a rounded right angle, a few long hairs in posterior fringe. Hind tibia rather clavate, with large, bare, convex disk, both fringes very long. Hind basitarsus (= 42 × 13), moderately long, rather broad, posterior apical angle a rounded right angle, dorsal fringe very long. Hairs of gaster long and shaggy. Gastral tergite 6 with apical margin strongly thickened and somewhat recurved, centre feebly truncate, postapical fringe weak. Gastral sternite 7 rather narrowly crescentic with two separate groups of long bristles, no lines or fenestrae. Gastral sternite 8 produced into a tongue-like process, sides very converging posteriorly, almost pointed, a small posterior area of short bristles, no fenestrae, sometimes two weak parallel lines on disk. Genitalia relatively elongate ; stipes with no inner impressions ; sagitta in dorsal view rather narrow and sinuate, apex not bent down, with a preapical flange forming a small tooth, at apex slightly hooked on both sides, in side view narrow at base then considerably widened with a large central tooth, a smaller tooth beneath the flange, all these details varying somewhat specifically ; spatha wide, sides strongly converging, at centre three times as wide as sagitta ; squama large, longer than broad, inner and outer sides parallel and the whole structure somewhat bent inwards, the inner edge at a lower level feebly serrate, a slight emargination forming a very small process next the end of the stipes, details of squama varying specifically ; lacinia very long, projecting some way beyond the squama, narrowed but a little before the apex widened again, apex slightly emarginate, inner corner produced inwards into a feeble, rounded, serrate lobe ; bristles on volsellar area dense but not long.

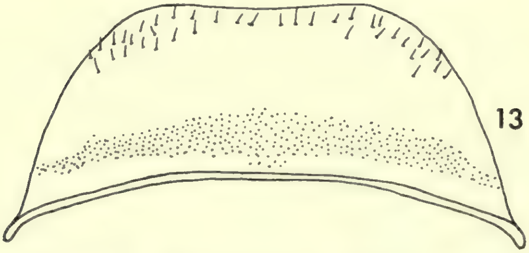
Illustrations. Sting—Franklin, 1913 : fig. 173 ; Hazeltine & Chandler, 1964 : pl. 5. Gastral sternites 7 and 8—Franklin, 1913 : figs. 115, 123, 165 ; Richards, 1931 : pl. 1 ; Pittioni, 1939a : pl. 3, fig. 3. Genitalia—Franklin, 1913 : fig. 173 ; Pittioni, 1939a : pl. 3, fig. 3.

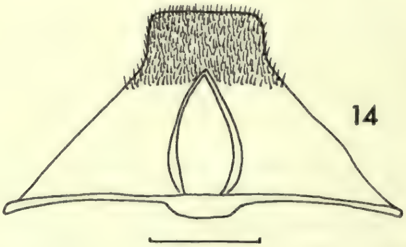
ALPS, ARCTIC EURASIA and AMERICA, Rocky Mts., Californian Sierras.

## 19. ***ROBUSTOBOMBUS*** Skorikov, 1922

*Volucellobombus* Skorikov, 1922

♀. Ocelli separated by two diameters or rather less from eyes, lying well in front of postocular line. Frons with large areas both in front and behind the level of the ocelli without punctures, unpunctured areas very large and ill-defined, no band of fine sculpture along inner margin of eyes. Dorsal furrow of genera absent. Antennal segments 3 : 4 : 5 = 10 : 5½ : 6½, segment 3 rather more than twice as long as broad. Clypeus rather short, strongly swollen, with few or only a moderate number of punctures, apical impressions feeble, with a few large punctures or with numerous small ones in addition. Labrum with tubercles moderately convex and angled at inner end, furrow very wide, about as wide as length of antennal segment 3, lamella not wide, curved. Mandibles with a feeble incisura and a strong sulcus obliquus. Malar space (= 10) distinctly transverse, shorter than or no longer than antennal segment 3. Mid basitarsus with the apical dorsal angle hardly less than a right angle. Hind tibia with corbicular surface dull, densely reticulate (though much more finely than in *Mendacibombus*), proximal third of surface with long bristles, dorsal inner apical corner with a short but acute process. Hind basitarsus not densely pubescent but whole surface and margins with much





FIGS. 13–14. *Bombus robustus* Smith. 13, gastral sternite 7 ; 14, gastral sternite 8.

coarser bristles than usual. Gastral tergite 6 shining, finely granulate. Sting with outer thickenings of the sheath moderately broad and of even width, inner thickenings considerably widened below, the wide part ending in an emargination defined by two blackened and somewhat projecting points, the emargination sometimes bounded externally by a small blackened line, intervening membrane undifferentiated or raised dorsally into a horseshoe-like fold, a little blackened at each end. Wings infuscate.

♂. Relatively small. Eyes rather swollen, temples rather narrow dorsally, ocelli separated by a little less than one diameter from eyes, far in front of postocular line. Antennae long, segments 3 : 4 : 5 : 8 = 7½ : 5 : 8 : 7, penultimate segments straight. Mandibles with one wide bentral and one small dorsal tooth, beard dense, moderately long. Malar space (= 4) transverse, about as long as antennal segment 4, scarcely punctured. Mid basitarsus (= 42 × 8) very long and narrow, somewhat narrowed at each end, posterior apical angle completely rounded, dorsal margin with very long bristles and a few also on the disk. Hind tibia moderately clavate, convex, a little dull and reticulate, with moderately long hairs throughout, fringes long, especially the dorsal one. Hind basitarsus (43 × 11) moderately long and broad, somewhat narrowed basally, posterior apical angle a rounded right angle, posterior margin with numerous long bristles. Pubescence of gaster long and shaggy. Gastral sternite 6 with margin rounded, scarcely thickened, with a dense, pale postapical fringe. Gastral sternite 7 widely crescentic, apical margin somewhat truncate, almost no bristles, no lines or fenestrae. Gastral sternite 8 with a tongue-like projection with its sides converging and only becoming parallel near the apex which is straight, angles rounded, a large apical patch of short dense bristles, no fenestra, two lines which converge close to one another posteriorly. Genitalia moderately large and elongate ; stipes not curved in at apex, with wide, deep, inner impressions ; sagitta in dorsal view narrow, bent downwards and hooked inwards at apex, tip of hook with a long, relatively narrow point, outer side with a moderately long and broad, weakly serrate flange, in side view with sagitta is only about twice as wide, not widened at base and without a tooth ; spatha rather narrow, sides not much converging, about one and a half times as wide in centre as sagitta ; squama very transverse but considerably widened inwards, outer edge with a considerable rounded-angular projection, considerably narrowed to the actual apex and here with a small bristle tuft and a little emarginate with the inner corner produced into a long, curved hook ; volsella area with short not very dense bristles.

Illustrations. Sting—Text-fig. 12. Gastral sternites 7 and 8—Text-figs. 13, 14. Genitalia—Franklin, 1913 : figs. 181, 197.

Southern C. and S. AMERICA.

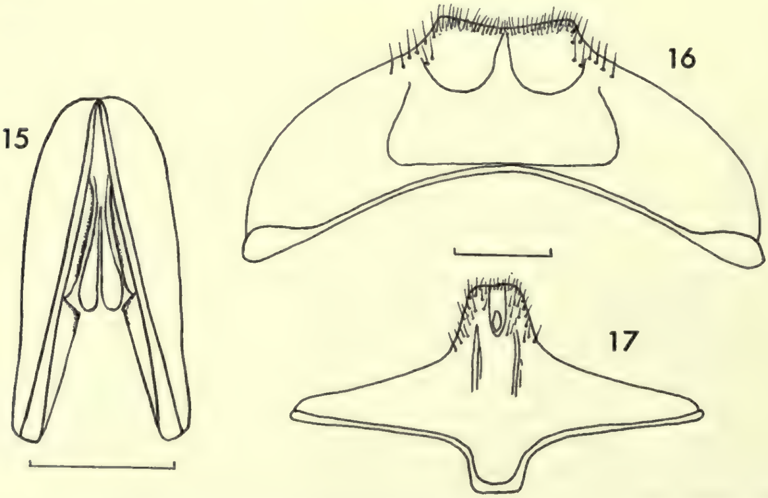
## 20. ***RUBICUNDOBOMBUS*** Skorikov, 1922

♀. Ocelli separated by three diameters from eyes, lying a little in front of postocular line. Frons rather closely punctured, unpunctured areas large but not well-defined, a well-marked band of fine punctures along inner margin of eyes. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 8 : 4 : 6½, segment 3 slightly more than twice as long as broad. Clypeus rather short, basal half much swollen, ventral third flattened, whole with numerous punctures, mostly large, apical impressions not defined, with close, rather small punctures. Labrum with tubercles convex, rather strongly angled at inner end, furrow very narrow, much narrower than the length of antennal segment 3, lamella not wide, moderately curved. Mandibles with a feeble incisura and a strong sulcus obliquus. Malar space (= 8) short and transverse, as long as antennal segment 3, without any punctures. Mid basitarsus with apical dorsal angle almost rounded. Hind tibia with corbicular surface rather dull, finely reticulate, proximal two fifths with rather sparse bristles on disk, dorsal inner apical corner distinctly produced. Hind basitarsus not densely pubescent but for the bristles on the dorsal edge. Gastral tergite 6 dull, finely reticulate, finely and sparsely punctured. Sting with outer thickenings of the sheath very wide, inner thickenings gradually widening upwards from below but soon ending in a right-angled truncation, above this widening again in a smooth curve, margins somewhat blackened, intervening membrane forming on each side a somewhat pyriform, convex, deep brown lobe. Wings dark.

♂. Of moderate size. Eyes hardly enlarged, ocelli separated by one and a half diameters from eyes lying far in front of postocular line. Antennae not long, segments 3 : 4 : 5 : 8 = 6 : 4 : 6½ : 5½, penultimate segments straight. Mandibles with one broad ventral and a narrow dorsal tooth, beard long and dense. Malar space transverse (= 5), about as long as antennal segment 3, unpunctured. Mid basitarsus (= 39 × 8½) long, nearly parallel-sided, posterior apical angle a rounded right-angle, posterior fringe long. Hind tibia rather clavate, convex and with numerous rather long bristles on basal two thirds, apical third bare, weakly reticulate, dorsal fringe very long, ventral one much shorter. Hind basitarsus (= 38 × 13) relatively short and broad, somewhat narrowed to base, dorsal margin somewhat curved, with a very long fringe, posterior apical angle rounded. Hairs of gaster dense and rather uneven, tergites closely, rather coarsely punctured and reticulate. Gastral sternite 6 somewhat produced, especially over central quarter which is truncate and feebly emarginate, with a small depression embracing the truncation and extending a short way forwards. Gastral tergite 7 transverse with the central quarter moderately produced, shallowly emarginate, corners angled, with two dense tufts of bristles, disk with two suboval fenestrae, on each side of produced part with a semioval marginal reticulate area. Gastral sternite 8 subtriangular, the produced part with strongly converging sides, apex shallowly emarginate, with dense short bristles, disk with two parallel lines. Genitalia elongate, rather large ; stipes with a deep, sharp-edged inner impression over two-thirds its width ; sagitta in dorsal view narrow, not much bent down at tip, apex acutely pointed, behind this on inner side a small flange leading some way to a small inner dorsal tooth, in side view sagitta much wider, gradually narrowing to apex, no ventral emargination or tooth ; spatha rather narrow, about one and a half times as wide as sagitta, sides sub-parallel ; squama quite large, externally rounded, inner side with a large, deep, almost circular emargination, producing internally a wide posterior and a much narrower, pointed anterior process ; lacinia not projecting beyond squama, rather wide, apex truncate, with a dense tuft of relatively long bristles, inner end forming a small hook ; volsellar area with dense, short bristles.

Illustrations. Sting—Text-fig. 15. Gastral sternites 7 and 8—Text-figs. 16, 17 ; Franklin 1913 : fig. 152. Genitalia—Franklin, 1913 : figs. 186, 195.

S. America.



Figs. 15–17. *Bombus rubicundus* Smith. 15, sting ; 16, gastral sternite 7 ; 17, gastral sternite 8.

## 21. ***COCCINEOBOMBUS*** Skorikov, 1922

♀. Ocelli separated by two and a half diameters from eyes, lying entirely in front of postocular line. Frons with rather numerous, not very large punctures, unpunctured areas moderately large and well-defined but with a wide transverse band of fine punctures across the middle, another band of fine and a few large punctures along inner margin of eye, temples with a wide unpunctured band next to eyes. Dorsal furrow of gena absent. Antennae with segments $3 : 4 : 5 = 10\frac{1}{2} : 6\frac{1}{2} : 7$, segment 3 just over twice as long as broad. Clypeus a little broader than long, not much swollen, with moderately numerous, mostly large punctures over whole surface, apical impressions fairly distinct, large, with numerous punctures, some large. Labrum with tubercles large, strongly punctured but not angular, furrow wide and rather shallow, not quite as wide as length of antennal segment 3, ill-defined, lamella much wider than furrow, feebly curved. Mandibles with no incisura or sulcus obliquus. Malar space just transverse (= 17), about as long as antennal segments 2 + 3. Mid basitarsus with posterior apical angle about a right angle. Hind tibia with surface dull, finely reticulate, whole surface with scattered but quite numerous short, non-feathered hairs, corbicle moderately dense, inner dorsal apical angle long, acute. Hind basitarsus with apical dorsal angle just acute, no bristles on margins longer than half its width, surface with dense, feathered, black pubescence. Gastral tergite 6 dull, granulate, apical quarter with a raised boss (almost as in *Melanobombus*) but divided by a deep, well-defined furrow. Sting with outer thickenings of sheath wide dorsally and

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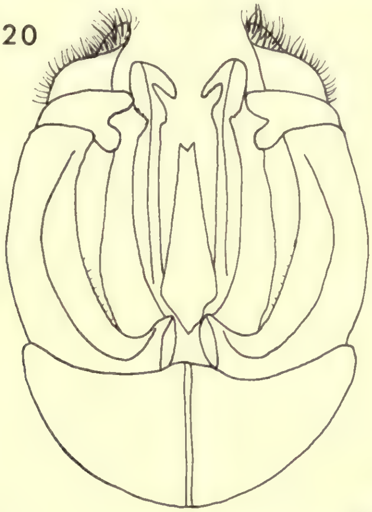

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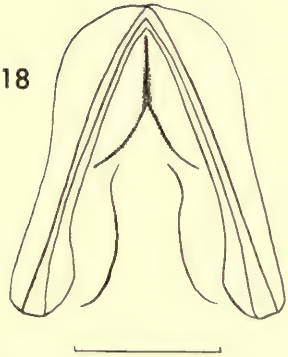

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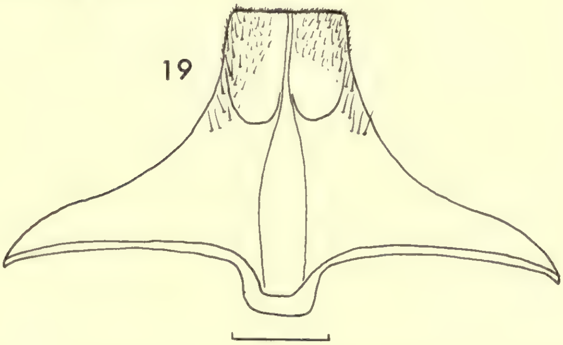


Figs. 18–20. *Bombus coccineus* Friese. 18, sting ; 19, gastral sternite 8 ; 20, ♂ genitalia.

narrow ventrally, inner thickenings moderately widened on ventral quarter, above this narrow, not darkened, intervening membrane dark, rather convex dorsally. Wings subhyaline.

♂. Relatively small and narrow ; eyes not swollen, ocelli separated by two diameters from eyes, lying distinctly in front of postocular line. Antennae moderately long, segments 3 : 4 : 5 : 8 = 7½ : 4 : 6½ : 7½, penultimate segments not curved. Mandibles with broad ventral and small dorsal tooth, beard long and dense. Malar space about quadrate (= 9), not quite as long as antennal segments 2 + 3, unpunctured. Mid basitarsus (= 47 × 12) long, narrow, somewhat narrowed at each end, posterior apical angle quite rounded off, posterior fringe long but diffuse. Hind tibia moderately widened, surface shining but alutaceous, with sparse short hairs, fringes, especially dorsal one, long and dense. Hind basitarsus (= 47 × 13) moderately long and broad, somewhat narrowed at base, posterior apical angle a rounded right angle, dorsal edge with a long, rather dense fringe. Hairs of gaster rather shaggy. Gastral sternite 6 a little recurved and thickened at apex with a dense apical fringe. Gastral sternite 7 transverse, apex widely emarginate with a small tooth in centre of emargination, two large reticulate areas on each side, just connected along posterior margin, two small lateral areas of short bristles, no fenestrae. Gastral sternite 8 produced in a long, rather narrow, mostly parallel-sided tongue, apex truncate, a large apical area of short dense bristles, two parallel lines on disk. Genitalia rather short and broad, dull ; stipes wide with a deep wide inner impression, basal inner process strong, almost parallel-sided ; sagitta in dorsal view narrow, ventral half much more sclerotised than dorsal half, apex bent downwards and hooked inwards, hook pointed, inner edge straight (almost a half arrow head) outer side with a narrow, very finely serrate edge, sagitta in lateral view twice as wide, no ventral tooth or emargination ; spatha about two and a half times as wide in centre as sagitta, sides rather converging ; squama short and very transverse, angles rounded, projecting inwards beyond the stipes, a second rather thickened inner lobe separated from the posterior one by a narrow emargination ; lacinia projecting a short distance beyond squama, generally curved and parallel-sided, a bit narrowed at apex but twisting inwards and upwards, actual tip narrow and rounded truncate, both inner and outer surfaces with dense short pubescence ; volsellar region with short, not very dense pubescence.

Illustrations. Sting—Text-fig. 18. Gastral sternites 7 and 8—Text-fig. 19 ; Franklin, 1913 : fig. 155. Genitalia—Fig. 20 ; Franklin, 1913 : figs. 185, 191, 192.

Western S. America.

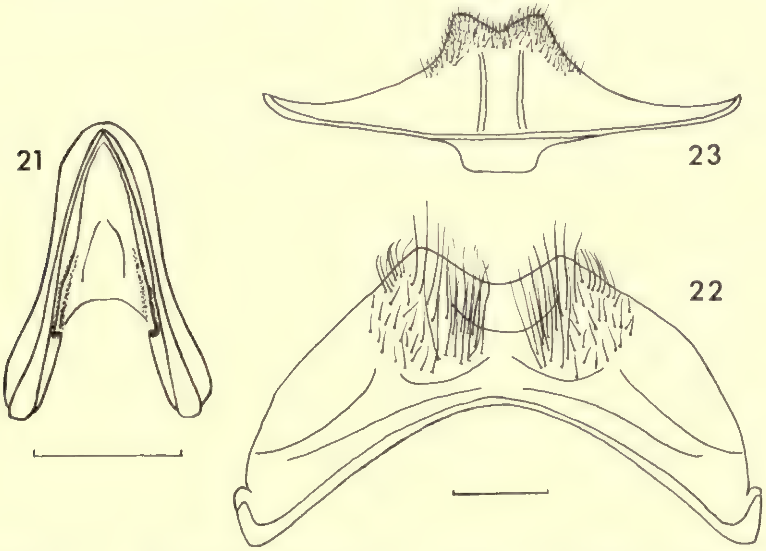
## 22. ***FUNEBRIBOMBUS*** Skorikov, 1922

♀. Ocelli separated by two and a half diameters from eyes, lying rather distinctly in front of postocular line. Frons quite closely punctured, unpunctured areas large but well-defined, a wide band of fine punctures along inner margins of eyes. Dorsal furrow of gena absent. Antennae with segments 3 : 4 : 5 = 9 : 5 : 6, segment 3 nearly two and a half times as long as broad. Clypeus short, swollen, with numerous punctures mostly large, apical impressions moderately distinct, with close large or moderately large punctures. Labrum with tubercles convex, angled at inner end, furrow narrow, clearly narrower than length of antennal segment 3, lamella little curved, moderately wide. Mandibles with no incisura, ventral corner produced into a short, acute process, sulcus obliquus moderately strong. Malar space moderately transverse (= 9), about as long as antennal segment 3. Mid basitarsus with apical dorsal angle almost rounded. Hind tibia with corbicular surface bare, feebly reticulate, inner dorsal apical angle almost spinosely produced. Hind basitarsus with apical dorsal angle just less than a right angle, surface unusually bare and shining, bristles nowhere dense or long. Gastral tergite 6 shining, on posterior half dull, reticulate and finely and rather closely punctured with traces of a feeble longitudinal furrow. Sting with outer thickenings of sheath moderately broad, inner thickenings gradually but not very strongly widened below, ending above in rounded blackened knob, above this slightly widened again and sending down an ill-defined process towards the knob, lower part dark and margin blackened, upper process slightly blackened, intervening membrane little differentiated. Wings evenly but not greatly infuscate.

♂. Relatively small ; eyes a little swollen though temples are quite broad, ocelli separated by rather less than two diameters from eyes, lying well in front of postocular line. Antennae long, segments 3 : 4 : 5 : 8 = 8 : 5 : 7 : $7\frac{1}{2}$, penultimate segments hardly curved. Mandibles with a broad ventral and a small dorsal tooth, beard long and dense. Malar space just transverse (= 6), a little longer than antennal segment 4 but shorter than 5, with scattered fine punctures. Mid basitarsus (= 40 × 10) moderately long and parallel-sided, posterior apical angle a rounded angle, posterior fringe long. Hind tibia clavate, convex, finely reticulate, a little shining, hairy throughout, hairs moderately long and not dense, dorsal fringe long and moderately dense, ventral fringe shorter and denser. Hind basitarsus (= 37 × 11) somewhat narrowed at base, posterior apical angle acute but not very sharp, dorsal fringe and some discal hairs near it very long, at least twice as long as width of tarsus. Hairs of gaster, long, shaggy, not very dense. Gastral sternite 6 hardly thickened or reflexed at apex, slightly truncate. Gastral sternite 7 widely crescentic, apex weakly emarginate, with a preapical submembranous area and two patches of long bristles before apex, no lines (except some transverse ones) or fenestrae. Gastral sternite 8 widely produced, sides of produced part concave and considerably diverging anteriorly, apex a little emarginate, an apical patch of dense, short bristles, spreading sparsely down each side, two widely separated feebly curved lines, almost parallel. Genitalia relatively long and large ; impressions of stipes small and ill-defined ; sagittae in dorsal view narrow, curved down at apex almost at apex, curving outwards, then inwards but apex scarcely hooked, a distinct serrate preapical outer flange, in lateral view sagitta about twice as wide, no ventral tooth or emargination ; spatha rather wide and strongly narrowing posteriorly, at centre two and a half times as wide as sagitta ; squama strongly transverse, short and rounded off externally, longer but also rounded off internally, inner edge emarginate, with a narrow, subacute anterior lobe, not projecting far inwards beyond the stipes ; lacinia projecting a moderate distance beyond squama, rather narrow, moderately curved inwards, apex with small, inner hook-like projection, outer edge with rather dense hairs ; volsellar region without dense bristles.

Illustrations. Sting—Text-fig. 21. Gastral sternites 7 and 8—Franklin, 1913 : fig. 153 ; Text-figs. 22, 23. Genitalia—Franklin, 1913 : figs. 178, 180.

Western S. AMERICA.



FIGS. 21–23. *Bombus funebris* Smith. 21, sting ; 22, gastral sternite 7 ; 23, gastral sternite 8.

## Section *ODONTOBOMBUS* Krüger

This group of subgenera has always been rather difficult to deal with and its members are on the whole more uniform than those of the previous sections. The males are often distinct, though it is not always easy to decide to what level of divergence subgeneric rank should be given, but the characters of the females are much less pronounced and it is difficult to make a useful key to them. The arrangement adopted below is provisional ; it seemed, at this stage, it might be better to define as many groups as possible ; it would not be difficult later to sink some of them.

### 23. ***MEGABOMBUS*** von Dalla Torre, 1880

*Hortobombus* Vogt, 1911

♀. Ocelli separated by three diameters from eyes, lying just in front of postocular line. Frons finely and rather closely punctured, unpunctured areas small and well-defined, a wide band of fine sculpture along inner margins of eyes. Dorsal furrow of gena occasionally developed as in *B. gerstaeckeri* Morawitz. Antennae with segments 3 : 4 : 5 = 10½ : 5 : 6, segment 3 nearly or quite three times as long as broad. Clypeus elongate, swollen dorsally, flattened ventrally, general surface little punctured, several rows of minute punctures along dorsal third of mid line, apical impressions feeble but more closely punctured. Labrum with tubercles rounded, little convex, largely smooth, furrow narrow but shallow, lamella rather broad and margin gently curved. Mandibles with no incisura, sulcus obliquus strong or moderate. Malar space very elongate (= 21), about as long as antennal segments 2 + 3 + 4. Mid basitarsus with apical dorsal angle spinosely produced. Hind tibia with corbicular surface bare and shining, inner dorsal apical angle with a short, wide, sharp process. Hind basitarsus with apical dorsal angle spinosely produced, surface rather more bristly than usual. Gastral tergite 6 shining, finely or coarsely granulate, often with a preapical furrow. Sting with outer thickenings of the sheath rather narrow throughout, more or less blackened near centre, inner thickenings rather strongly widened below, rather suddenly narrowed just above the middle, margins just above and below this extensively blackened, intervening membrane raised into a lobe on each side and strongly blackened at end of lobe opposite the point where the inner thickenings are narrowed. Wings evenly but only in a few species strongly infuscate.

♂. Relatively large. Eyes not at all swollen, ocelli separated by three diameters from eyes, lying on the postocular line. Antennae long, segments 3 : 4 : 5 : 8 = 8 : 4½ : 7½ : 7½, penultimate segments each a little curved. Mandibles with one broad ventral and one small dorsal tooth, beard long and dense. Malar space very elongate (= 16), about as long as antennal segment 2 + 3 + 4, unpunctured. Mid basitarsus moderately long (= 38 × 9) and slightly narrowed at each end. Posterior apical angle just less than a right angle, fringes short. Hind tibia distinctly flattened, disk with rugose margins from which the hairs arise, somewhat dull and very finely reticulate, both fringes long. Hind basitarsus rather broad (= 36 × 13), apical posterior angle about 80°, fringes short. Hairs of gaster rather long and dense. Gastral sternite 6 with apical margin a little thickened and recurved, hardly truncate. Gastral sternite 7 widely crescentic, central third of hind margin a little more produced, two large and narrowly separated patches of long, black bristles, no lines or fenestrae. Gastral sternite 8 with a wide base and central quarter with a tongue-like process, sides a little concave, apex straight, large apical area of short bristles, two parallel lines, no fenestrae. Genitalia rather large ; stipes with inner impressions small and not well-defined ; sagittae in dorsal view narrow, distal half serrate on lower outer edge, tip not hooked, sagitta in side view widening only at base, no ventral emargination or tooth ; spatha narrow for most of its length, hardly wider than sagitta, sides scarcely convergent ; squama large, projecting far beyond stipes, on inner side a wide, curved upright lamella which defines and two-thirds encloses an oval area, all corners rounded but anterior end produced upwards into a sharp spike ; lacinia rather narrow, extending well beyond squama, curved inwards, tip with a peculiar process rather like the " toe of Italy ", volsellar region with stout, not very dense bristles.

Illustrations. Sting—Richards, 1927 : fig. 46 ; Hazeltine & Chandler, 1964 : pl. 3. Gastral sternites 7 and 8—Frison, 1935 : figs. 2d, e, 3c, d ; Pittioni, 1939a : pl. 1, fig. 1. Genitalia—Krüger, 1920 : pl. 5, fig. a ; Richards, 1927 : fig. 26 ; Frison, 1935 : figs. 2c, 3b ; Pittioni, 1939a : pl. 1, fig. 1.

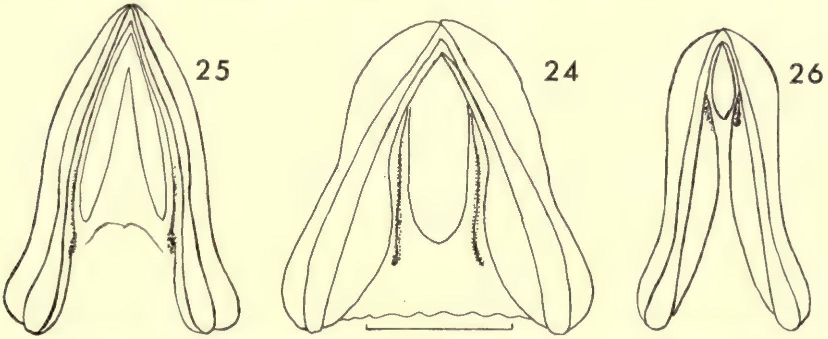
EUROPE to CHINA and JAPAN, apparently not south of China.

[*Bombus melanopoda* Cockerell is a true *Megabombus* and was described from Sumatra. The record requires substantiation though the type exists in the British Museum and there is no obvious reason to doubt the label.]

## 24. ***DIVERSOBOMBUS*** Skorikov, 1914

♀. Ocelli separated by three diameters from eyes, lying just in front of postocular line. Frons anteriorly shining, coarsely and moderately closely punctured, posteriorly dull, very closely and finely punctured, unpunctured areas rather small and well-defined, a moderately broad band of fine sculpture along inner margin of eyes. Dorsal furrow of gena occasionally indicated. Antennae with segments 3 : 4 : 5 = 9 : 4 : 7, segment 3 two and a half times as long as broad. Clypeus elongate, swollen, finely and generally rather sparsely punctured, apical impressions feeble with rather closer punctures. Labrum with tubercles moderately convex and angled at inner end, furrow rather deep and narrow, narrower than length of antennal segment 3, lamella wide, little curved. Mandibles with no incisura, sulcus obliquus strong. Malar space very elongate (= 16), longer than antennal segments 2 + 3, nearly as long as 2 + 3 + 4, with a few scattered fine punctures. Mid basitarsus with apical dorsal angle spinosely produced. Hind tibia with corbicular surface bare, feebly reticulate, inner dorsal angle very feebly produced. Hind basitarsus with dorsal apical angle not very acute, bristles all short. Gastral tergite 6 moderately shining, coarsely granulate, apex often with a small convex boss. Sting with outer thickenings of sheath moderately widened, especially above, inner thickenings strongly, almost angularly, widened, widest well below middle, not blackened, intervening membrane hardened and darkened dorsally. Wings evenly infuscate.

♂. Very small compared with ♀. Eyes not at all swollen, ocelli separated by three diameters from eyes, lying just in front of postocular line. Antennae very long, each segment after fourth slightly curved, segments 3 : 4 : 5 : 8 = 6 : 4 : 7½ : 7½. Mandibles with one large ventral and one small dorsal tooth, beard dense, moderately long. Malar space very elongate (= 13), as long as antennal segments 2 + 3, with sparse fine punctures throughout. Mid basitarsus (= 44 × 8½) rather long and narrow, slightly narrowed at each end, apical dorsal



FIGS. 24–26. Stings of, 24, *Bombus diversus* Smith ; 25, *B. senex* Vollenhoven ; 26, *B. tricornis* Radoszkowsky.

angle a right angle, fringes short. Hind tibia only slightly convex, shining, most of surface with sparse, rather short bristles but a narrow, subapical disk bare, fringes moderately long and stout, not very dense. Hind basitarsus (= 43 × 13) moderately broad, considerably narrowed at base, apical dorsal angle just less than a right angle, fringes short. Hairs of gaster often relatively sparse. Gastral sternite 6 with apex very slightly thickened, not recurved, rounded, with a moderately dense postapical fringe. Gastral sternite 7 crescentic ; posterior margin rounded, with two rather approximated patches of moderately long bristles. Gastral sternite 8 considerably produced but sides of produced part clearly convergent, apex weakly angulated, angles almost rounded, a large apical patch of dense, short bristles. Genitalia relatively large and elongate ; stipes with a well-marked inner impression for more than half its width ; sagittae in dorsal view relatively narrow, somewhat sinuate in then out, apex bent down and with a well-marked transverse flange on outer side, top of flange forming a small tooth, sagitta in side view much broader, especially at base, emarginate beneath but end of emargination hardly forming a tooth ; spatha long and narrow, about as wide as sagitta, sides subparallel ; squama mostly narrow and transverse with its posterior margin curved parallel with end of stipes, posterior inner end produced into a rounded thumb-shaped process, anterior inner end produced into a long curved hook extending as far back as posterior margin ; lacinia proximally narrow, curved, parallel-sided, posteriorly with a characteristic spur-like process with a posterior spike and anterior crescentic serrate process, another external subtriangular spike preceding the posterior one ; volsella region with long, moderately dense bristles.

Illustrations. Sting—Text-fig. 24. Gastral sternites 7 and 8—Frison, 1934 : figs. 7c, d. Genitalia—Frison, 1934 : fig. 7a.

ASIA.

## 25. *SENEXIBOMBUS* Frison, 1930

♀. Ocelli separated by about three diameters from eyes, lying a little in front of postocular line. Frons moderately closely and strongly punctured, very finely and closely behind the ocelli, rather less close and more shining at sides, unpunctured areas large, not well-defined, no band of fine sculpture along inner margin of eyes. Dorsal furrow of gena absent. Antennae with segments 3 : 4 : 5 = 10 : 5 : 5, segment 3 two and a half times as long as broad. Clypeus moderately elongate, not much swollen, closely and coarsely punctured on dorsal third, rest unpunctured, apical impressions large, deep, moderately coarsely punctured. Labrum with tubercles moderately raised and angulated at inner end, shining, coarsely punctured, furrow wide and shallow, wider than length of antennal segment 3, lamella straight-edged, very wide. Mandibles with a very weak incisura and a strong sulcus obliquus. Malar space about quadrate (= 15), longer than antennal segment 3 but about as long as 2 + 3, with numerous fine punctures, especially on the lower half. Mid basitarsus with apical dorsal angle acutely spinose. Hind tibia with corbicular surface bare, very weakly convex, feebly reticulate, inner dorsal apical angle strongly produced. Hind basitarsus with apical dorsal angle acute, without long bristles. Gastral tergite 5 rather closely and coarsely punctured, tergite 6 feebly granulate, moderately shining. Sting with outer thickenings of sheath rather wide, even wider dorsally, inner thickenings rather narrow, moderately wide in middle, narrowing above and below, upper half blackened, blackening at about the middle, with a small downwardly directed process projecting into the membrane which is thrown into two folds. Wings feebly infuscate or yellow-brown.

♂. Relatively large. Eyes not swollen, ocelli separated by three diameters from eyes, lying just on the postocular line. Antennae very long, segments 3 : 4 : 5 : 8 = 7½ : 5 : 12 : 11½, penultimate segments each a little curved. Mandibles with a broad ventral and small dorsal tooth, beard long and dense. Malar space considerably longer than broad (= 13), just longer than antennal segment 5, closely and relatively strongly punctured except for a small antero-dorsal patch. Mid basitarsus (= 54 × 14), long, a little narrowed at each end, apical dorsal angle acute, fringe shorter than basal width. Hind tibia not very clavate or convex, densely hairy with feathered hairs of moderate length, both fringes long and dense. Hind basitarsus (= 60 × 18) considerably narrowed to base, apical dorsal angle acute, fringes short. Gaster with short rather dense hairs, tergites 1–5 with margins pale, almost white. Gastral sternite 6 with apex a little thickened and truncate. Gastral sternite 7 widely crescentic with two closely approximated patches of short bristles, no lines or fenestrae. Gastral sternite 8 considerably produced but sides of production diverging anteriorly, apex feebly emarginate, its angles rounded, a moderate apical patch of dense short bristles, a short longitudinal line on disk and sometimes two small fenestrae on each side. Genitalia large ; stipes narrow distally, with wide but ill-defined depressions ; sagitta narrow in dorsal view, bent down at apex but not curved or widened, outer side serrate on posterior third, first tooth of serration much larger, in side view about twice as wide (except quite near base) emarginate beneath to form a strong angle near centre ; spatha very narrow hardly wider than sagitta, sides scarcely convergent ; squama very large, obliquely transverse, outer end rounded-rectangular, inner end produced into a large hook-like lobe extending well anteriorly to end of stipes, inside the hook can be seen a downwardly directed bifid process, the outer division of which is longer and more acute than the inner one ; lacinia rather narrow, curving inwards, apex narrow, curved upwards and outwards into a small hook, inner side with a long dense regular fringe continuous with a dense, long, posterior volsellar tuft.

Illustrations. Sting—Text-fig. 25. Gastral sternites 7 and 8—Frison, 1928 : pl. 1, figs. 2, 3 ; Frison, 1930 : figs. 2, 3. Genitalia—Frison, 1928 : pl. 1, fig. 1 ; Frison, 1930 : fig. 1.

EAST INDIES.

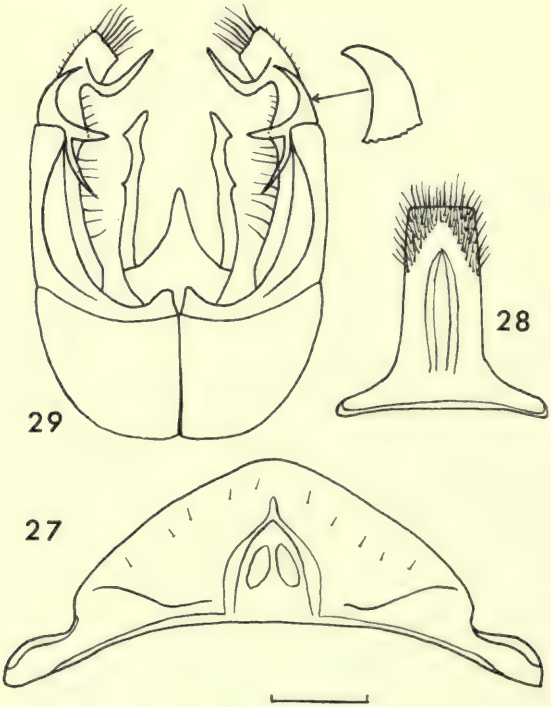
## 26. ***TRICORNIBOMBUS*** Skorikov, 1922

♀. Ocelli separated by three diameters from eyes, lying just in front of postocular line. Frons anteriorly rather closely and coarsely punctured, behind ocelli (also laterally) very closely and rather coarsely punctured, unpunctured areas rather small and well-defined, a wide band of close fine punctures along inner margin of eyes. Dorsal furrow of gena absent. Antennae with segments 3 : 4 : 5 = 7½ : 4½ : 5½ or (*B. atripes* Smith, 7½ : 5½ : 6½) segment 3 not quite two and a half times as long as broad. Clypeus elongate, little swollen, closely and mostly quite strongly punctured, only a small ventral disk smooth, apical impressions rather feeble with close, coarse punctures. Labrum with tubercles only moderately raised, rather flattened, not angled, large outer area smooth, furrow very wide and shallow, at least as wide as length of antennal segments 2 + 3, lamella very wide, feebly curved. Mandibles with no incisura and a strong sulcus obliquus. Malar space, longer than broad (= 12 or *B. atripes* Smith, 14), about as long or nearly as long as antennal segments 3 + 4 with a few fine punctures. Mid basitarsus with apical dorsal angle spinosely produced. Hind tibia with corbicular surface bare, hardly at all convex, distinctly reticulate, inner dorsal apical angle strongly produced. Hind basitarsus with apical dorsal angle distinct but short, bristles short. Gastral tergites very closely and coarsely punctured almost throughout except for narrow apical bands, tergite 6 dull, reticulate and with sparse, coarse granules, dense hairs more confined to sides than usual. Sting with outer thickenings only widened dorsally, inner thickenings very wide, bent inwards, becoming rather suddenly very narrow dorsally and at this point a bit blackened, membrane generally undifferentiated, but a convex central fold at dorsal end. Wings evenly infuscate, sometimes strongly so.

♂. Relatively small. Eyes not swollen, ocelli separated by three diameters from eyes, lying on postocular line. Antennae moderately long, segments 3 : 4 : 5 : 8 = 4 : 4 : 7 : 8 or 6½ : 6½ : 9½ : 12, penultimate segments all distinctly curved. Mandibles with a broad ventral and small dorsal tooth, beard rather long. Malar space a little longer than broad (= 8 or 9), about as long as antennal segments 3 + 4, scarcely or quite strongly punctured. Mid basitarsus (= 39 × 9 or 55 × 13) relatively long and parallel-sided, apical dorsal angle rounded or subacute, fringes short. Hind tibia with corbicular surface convex, shining, granulate with coarse hairs throughout, fringes short but of very stout bristles. Hind basitarsus (*B. atripes* = 61 × 17) moderately long and parallel-sided, apical dorsal angle acute, fringes short. Gaster with short, not very dense hairs, sculpture more or less granulate or confluently punctured. Gastral sternite 6 with apex widely rounded, thickened and a bit recurved. Gastral sternite 7 widely or long crescentic, apex sometimes a little produced, with a few black-based bristles, no or two converging lines, no or two small fenestrae. Gastral sternite 8 strongly produced, production almost parallel-sided, apex straight or nearly rounded, with a large apical patch of dense short bristles, two parallel lines on disk, sometimes with an oval fenestra at base. Genitalia not large ; stipes with distal angle produced inwards, inner impression strong and sharp-edged, two-thirds its width ; sagitta in dorsal view rather narrow, distinctly so on bent down apical part which is not hooked but has a wide, feebly serrate, outer flange, in lateral view sagitta wide with a deep emargination at centre, ending in a tooth, beyond this emarginate again before the flange ; spatha wide, at centre one and a half times as wide as sagitta, sides strongly converging ; squama with an outer rounded lobe set in an oblique plane, considerably or only a little longer than broad, very narrow where it adjoins inner half of stipes, at a much lower level produced on inside into two long, very acute lobes, directed obliquely forwards and backwards, or one downwards and the other obliquely upwards ; lacinia very wide, not extending very far beyond the squama, on inner side proximally with a very long acute hook, edge beyond the hook straight truncate, a bit serrate with rather long bristles ; volsellar region with long, moderately dense bristles.

Illustrations. Sting—Text-fig. 26. Gastral sternites 7 and 8—Text-figs. 27, 28. Genitalia—Text-fig. 29.

East Asia, mostly northern.



Figs. 27–29. *Bombus tricornis* Radoszkowsky. 27, gastral sternite 7 ; 28, gastral sternite 8 ; 29, genitalia.

## 27. ***LAESOBOMBUS*** Skorikov, 1922

The males of this subgenus are easily recognized but it is not certain that the females can be distinguished from all members of subgenus *Thoracobombus*.

♀. Ocelli separated by about three diameters from eyes, lying just in front of postocular line. Frons anteriorly strongly and not very closely punctured, posteriorly much more finely and closely, unpunctured areas rather large and well-defined, a narrow band of fine punctures along inner margin of eyes. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 9 : 4½ : 5, segment 3 about two and a half times as long as broad. Clypeus about as long as broad, rather swollen, with quite numerous punctures, mostly small but a few rather larger, apical impressions moderately distinct with close, large punctures. Labrum with tubercles flattened and very little raised, not at all angled, furrow wide and shallow, not quite as wide as length of antennal segment 3, lamella not strongly marked, half as wide as labrum, little curved. Mandibles with a weak incisura and a strong sulcus obliquus. Malar space about quadrate (= 10), distinctly shorter than antennal segments 2 + 3, scarcely punctured. Mid basitarsus with apical dorsal angle spinosely produced. Hind tibia with corbicular surface slightly convex on basal half, shining, not reticulate, inner dorsal apical angle with a strong but not very acute projection. Hind basitarsus with dorsal apical angle acutely spinose, bristles all short. Gastral tergite 6 moderately shining, coarsely granulate, not at all upturned at apex. Sting with outer thickenings of sheath not wide but somewhat more so dorsally, inner thickenings moderately widened over most of dorsal half, slightly blackened, membrane undifferentiated. Wings slightly and evenly darkened.

♂. Eyes not swollen, ocelli separated by three diameters from eyes, lying a little in front of postocular line. Antennae long, segments 3 : 4 : 5 : 8 = 4½ : 7 : 8½ : 9½, individual segments a little convex below. Mandibles with broad ventral and small dorsal tooth, beard rather long and dense. Malar space just longer than broad (= 6½), about as long as antennal segment 4, practically unpunctured. Mid basitarsus (= 35 × 8½) not long, moderately broad, dorsal apical angle moderately acute, fringes short. Hind tibia almost flat, mostly a little dull, more shining and concave on distal quarter where it is considerably widened, whole surface with sparse short bristles, fringes, especially dorsal one, long. Hind basitarsus (= 37 × 11) rather short and broad, dorsal edge feebly curved, dorsal apical angle distinct, no long bristles. Gaster with hairs short and dense, tergites finely but not rugosely punctate. Gastral sternite 6 with margin a little thickened, not recurved, with short, dense, pale, postapical fringe. Gastral sternite 7 crescentic with central part of margin a little produced and bisinuate, with a large continuous area of short bristles, no lines or fenestrae. Gastral sternite 8 narrow with a strongly produced central part which is approximately quadrate, with sides, apical margin and angles a little rounded, whole produced part with short bristles, two parallel lines on disk, no fenestrae. Genitalia rather elongate ; stipes wide, especially distally, inner impressions very weak ; sagitta in all views narrow except right at base, a little pointed and downcurved at apex, not serrate nor toothed beneath ; spatha broad, short, rapidly narrowing at centre, much wider than sagitta ; squama highly differentiated, large outer part mainly pale and submembranous, generally transverse, posteriorly produced into a wide rounded lobe, anterior to this the inner edge deeply emarginate and produced into an elaborate process which bears a long acute spine directed obliquely forwards and above this a large subcircular lobe (mainly in the vertical plane) with its dorsal edge serrate and the whole attached to the squama by a narrow stalk ; lacinia long and broad, projecting far beyond squama, broadly digitiform with end obliquely truncate, inner edge feebly emarginate and weakly serrate, opposite end beneath the rounded process of the squama produced inwards into a strong, parallel-sided process with its end moderately expanded and with sharp angles ; inner side of lacinia and volsellar region with rather dense stout bristles.

Illustrations. Sting—Text-fig. 30. Gastral sternites 7 and 8—Pittioni, 1939a : pl. 2, fig. 4. Genitalia—Krüger, 1920 : pl. 6, fig. i ; Pittioni, 1939a : pl. 2, fig. 4.

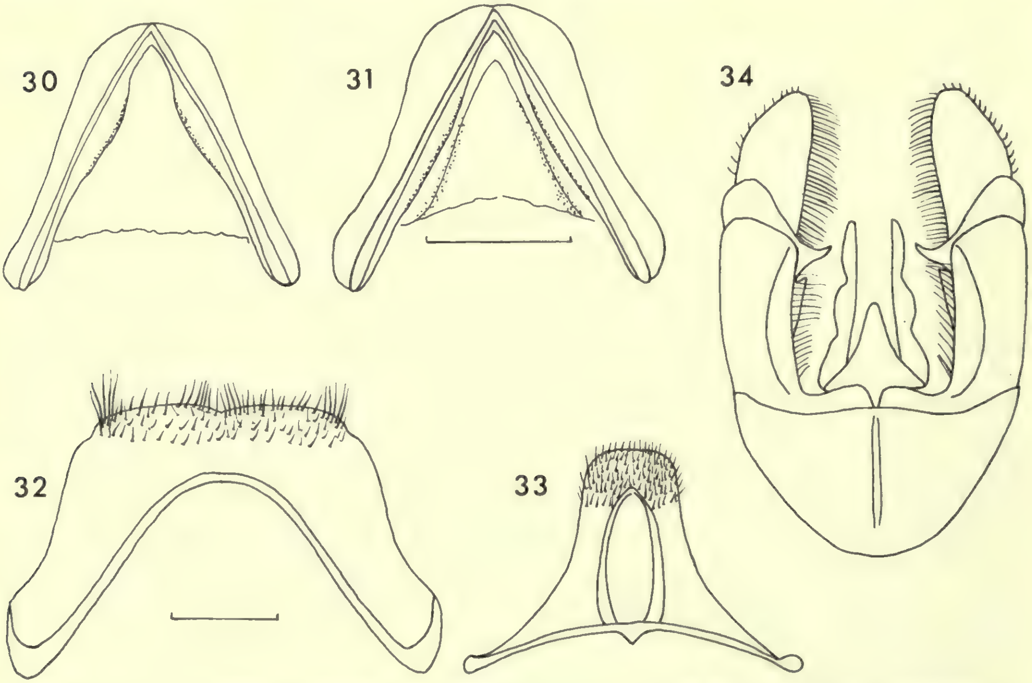
SPAIN and N. AFRICA to central U.S.S.R.

## 28. *EVERSMANNIBOMBUS* Skorikov, 1938

I am uncertain of the status of this group without further study of allied forms. Its characters are, however, listed.

♀. Ocelli separated by rather more than three diameters from eyes, lying just in front of the postocular line. Frons rather closely and strongly punctured, unpunctured areas small and well-defined, the areas narrowed from in front so that they are laterally pointed, two thirds of the space to the eye with very dense fine punctures. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 9½ : 5 : 5, segment 3 not quite three times as long as broad. Clypeus long, moderately swollen with rather numerous punctures, many large, apical impressions small with a narrow band of close punctures. Labrum with tubercles little raised or angled, somewhat flattened, furrow moderately wide and deep, not quite as wide as length of antennal segment 3, lamella wide, straight, but not prominent. Mandibles with no incisura, sulcus obliquus strong. Malar space just longer than quadrate (= 12), just longer than antennal segment 3, much of it finely punctured. Mid basitarsus with apical dorsal angle not strongly spinose. Hind tibia with corbicular surface not reticulate, inner apical dorsal angle with a small acute process. Hind basitarsus with apical dorsal angle moderately acute, no long bristles. Gastral tergite 6 moderately shining, moderately coarsely and closely granulate. Sting with outer thickenings of the sheath rather narrow, somewhat wider above, inner thickenings narrow, somewhat widened on central two thirds, and the centre of this part of margin somewhat blackened, the adjacent membrane also a bit blackened but otherwise undifferentiated. Wings moderately infuscate.

♂. Relatively large. Eyes not swollen, ocelli separated by three diameters from eyes, lying just in front of postocular line. Antennae long, segments 3 : 4 : 5 : 8 = 6½ : 5 : 7 : 7½,



FIGS. 30–34. 30, Sting of *Bombus laesus* Morawitz ; 31–34, *B. eversmanniellus* Skorikov, 31, Sting ; 32, gastral sternite 7 ; 33, gastral sternite 8 ; 34, genitalia.

penultimate segments hardly curved. Mandibles with a large ventral and a small dorsal tooth, beard long and dense. Malar space much longer than broad (= 8½), about as long as antennal segments 2 + 3, shorter than 3 + 4, with quite numerous strong punctures. Mid basitarsus moderately long nearly parallel-sided (= 38 × 9), apical dorsal angle a right angle, fringes short. Hind tibia feebly clavate, rather convex, disk shining with rather sparse coarse, bristle-bearing punctures, fringes shorter than the width of tibia. Hind basitarsus moderately long and broad (= 40 × 14), apical dorsal angle just acute, all bristles short. Gaster with close coarse punctures and some reticulations, hairs rather long and dense. Gastral sternite 6 flat, apex a little thickened, subtruncate, postapical fringe short, dense, pale. Gastral sternite 7 widely crescentic, apex rounded, practically whole surface with short bristles which along apical margin are longer and feathered, a central thickened line and a darker spot on each side of base, no fenestra. Gastral sternite 8 with a strong tongue-shaped projection, sides a little concave, apex rounded-truncate, practically the whole process with dense bristles which become dense at centre of sides, usually with a very large lannceolate fenestra with thickly margined sides, for two-thirds of its length. Genitalia rather long and large ; stipes long and wide with inner impressions very feeble ; sagitta in dorsal view narrow, not much curved down at end, slightly widened over central fifth and again on apical fifth, this apical part forming a slight, very feebly serrate, lateral flange, apex hardly acute, sagitta in side view with basal half very wide, suddenly narrowed and after a small emargination produced into a wide straight truncate lobe, then another small emargination before the apical flange ; squama small, transversely crescentic, sides and posterior margin in one continuous curve, squama almost evanescent at inner posterior end of stipes but produced here inwards into a moderately acute process which in a more anterior view forms an obliquely-lying plate, the dorsal edge of this plate forming a continuous S-shaped curve with posterior margin of squama ; lacinia long and broad, thumb-shaped, inner edge nearly straight with very dense curved, feathered bristles which are half as long as its width, outer edge more curved, apex narrowly rounded ; volsellar region also with dense bristles.

Illustrations. Sting—Text-fig. 31. Gastral sternites 7 and 8—Text-figs. 32, 33 ; Pittioni, 1937 : fig. 2. Genitalia—Text-fig. 34 ; Pittioni, 1937 : fig. 1.

EASTERN EUROPE.

## 29. *EXILOBOMBUS* Skorikov, 1922

♀. Ocelli separated by three diameters from eyes, lying just in front of postocular line. Frons moderately strong but rather sparsely punctured, shining but with a very faint reticulation, unpunctured areas large, fairly well defined, inner margin of eye with a band of microscopic punctures which broadens posteriorly and spreads almost half way across unpunctured area though the fine punctures here are not very dense. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 8 : 4 : 4, segment 3 two and a half times as long as broad. Clypeus a little longer than broad, somewhat convex, with numerous punctures, many of them large, apical impressions very narrow but rather deep, closely punctured. Labral tubercles little raised, smooth and rounded, hardly punctured, furrow broad and shallow, about as broad as length ot antennal segment 3, lamella broad and straight, considerably thickened. Mandibles with a distinct sulcus, incisura weak, basal area closely, aciculately punctured. Malar space a little longer than broad (= 10), longer than antennal segment 3, nearly as long as 2 + 3, unpunctured. Mid basitarsus strongly and acutely produced. Hind tibia with corbicular surface bare, shining, excessively finely reticulate, dorsal inner apical angle strongly produced, hind basitarsus with dorsal angle quite strongly produced, surface shining not very densely pubescent, margins without long bristles. Gastral tergite 6 dull, very finely and densely reticulate, with fine sparse punctures. Sting with outer thickenings of sheath wide above, narrow below, inner thickenings moderately widened on lower half, narrow on upper half, transition very gradual, thickenings separated from sheath by a narrow paler area, edge of narrow part of thickening a little darkened near mid point, membrane hardly differentiated, with two somewhat darkened lobes above. Wings feebly infuscate.

♂. Not seen.

Illustrations. Sting—Text-fig. 35.

EASTERN MONGOLIA and USSURI district.

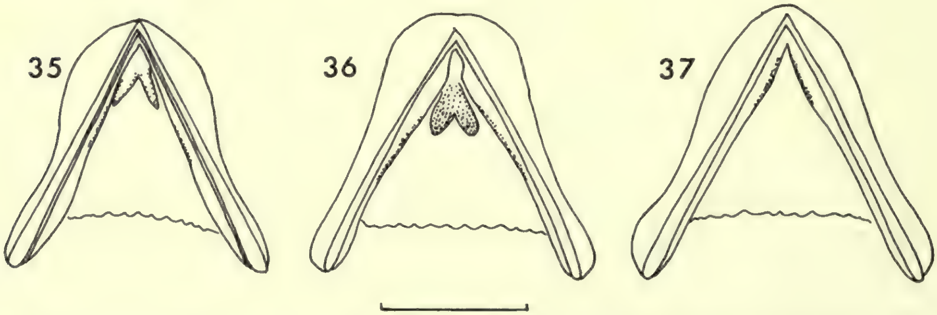
## 30. ***ADVENTORIBOMBUS*** Skorikov, 1922

The status of this group is very doubtful. Originally it seems to have been intended for all the species of *Agrobombus* Vogt (= *Thoracobombus*) which do not have a serrate sagitta in the male, that is for all of them except *B. pascuorum* (Scopoli) (= *agrorum* (Fabricius) ). This is a large and very diverse group of species but as it happens *B. adventor* (Skorikov) is unusually distinct in the female (the ♂ has not been available for study). Whether this species should form a separate subgenus or whether it and perhaps some other groups should all be united under *Thoracobombus* will have to be determined in the future. The female is described below.

♀. Ocelli separated by three diameters from eyes, lying just in front of postocular line. Frons anteriorly with rather sparse, coarse punctures, posteriorly dull, finely and closely punctured, unpunctured areas small, moderately well-defined, a wide band of close, fine sculpture along inner margin of eyes. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = $7\frac{1}{2}$ : $4\frac{1}{2}$ : 5, segment 3 about twice as long as broad. Clypeus elongate, swollen, with rather sparse, scattered punctures, mostly small, apical impressions very feeble with a row or two of moderately close punctures. Labrum with tubercles flattened and rounded, furrow rather narrow, clearly narrower than length of antennal segment 3, lamella inconspicuous. Mandibles with no incisura and a strong sulcus obliquus. Malar space distinctly longer than broad (= 14), at least as long as antennal segments 3 + 4, unpunctured. Mid basitarsus with apical dorsal angle long, spinose. Hind tibia with corbicular surface rather convex on basal half, shining, not reticulate, inner dorsal apical angle produced into a rather wide process. Hind basitarsus with apical dorsal angle quite strong, dorsal margin with some long bristles near base. Gastral tergite 6 upturned at apex, shining, with sparse, coarse, granulations. Sting with outer thickenings of sheath somewhat wider dorsally than ventrally, inner thickenings widening very gradually upwards, widest near top, then rather suddenly narrowing, a slight blackening of edge near centre, membrane with small central folds at top. Wings subhyaline.

Illustration. Sting—Text-fig. 36.

INNER MONGOLIA.



FIGS. 35–37. Stings of, 35, *Bombus exilis* Skorikov ; 36, *B. adventor* Skorikov ; 37, *B. mucidus* Gerstäcker.

## 31. ***THORACOBOMBUS*** von Dalla Torre, 1880

*Chromobombus* von Dalla Torre, 1880
*Agrobombus* Vogt, 1911

This is a large group with a considerable range in structure. Only some of the species have been examined and the characters given here are probably not found in all of them. It might have seemed natural to adopt the subgenus *Chromobombus* but the type-species *Bombus muscorum* Linnaeus raises a nomenclatorial problem because the ostensible type in the Linnean collection differs from the usual conception of the species. There is no doubt about the type-species of *Thoracobombus*, namely *Apis sylvarum* L., though it is a somewhat peripheral member of the group.

♀. Ocelli separated by three diameters from eyes, lying about on the postocular line. Frons shining and somewhat swollen in front with coarse, not very close punctures, posteriorly with very close rather fine punctures, unpunctured areas of moderate size, well-defined, a rather wide band of close fine punctures along inner margin of eyes. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 about = 7 : 4½ : 5, segment 3 twice as long as broad. Clypeus clearly longer than broad, swollen, with more or less fine, scattered punctures, apical impressions rather strong with close, moderately coarse punctures. Labrum with tubercles flattened and rounded, inner ends rounded, shallow furrow, rather less wide than length of antennal segment 3, lamella very wide and straight, sharp-edged or with edge thickened. Mandibles with no incisura, sulcus obliquus strong. Malar space distinctly longer than broad (= 12), about as long as antennal segments 3 + 4, with scattered fine punctures, especially on distal half. Mid basitarsus acutely spinosely produced. Hind tibia a little convex, not reticulate, inner dorsal apical angle distinctly produced. Hind basitarsus with short, rather sparse hairs, dorsal angle acute. Gastral tergite 6 moderately shining, finely granulate, a little upturned at apex. Sting with outer thickenings of sheath moderately wide, especially above, inner thickenings strongly widened upwards from below in *B. sylvarum* but considerably narrower in many other species, the middle of the broadest part sometimes projecting as a slight spur and margin below this slightly blackened, membrane undifferentiated. Wings evenly but usually only slightly infuscate.

♂. Of moderate size. Eyes not swollen, ocelli separated by three diameters from eyes, lying on postocular line. Antennae moderately long, segments 3 : 4 : 5 : 8 typically 6½ : 4½ : 8 : 8 but varying specifically, penultimate segments slightly or (*B. pascuorum* (Scopoli)) strongly thickened beneath. Mandibles with a broad ventral and small dorsal tooth, beard long and dense. Malar space distinctly longer than broad (= 8½), a little shorter than antennal segments 3 + 4, with scattered fine punctures. Mid basitarsus moderately long and parallel-sided (40 × 10), dorsal apical angle acute, fringes short. Hind tibia not very clavate, surface convex, cross-striate, not very shining, with dense, moderately long hairs throughout, dorsal fringe very long. Hind basitarsus moderately long and broad (43 × 13), apical dorsal angle subacute, all bristles short. Gaster with dense, moderately long hairs, with granulate punctures, rather dull. Gastral sternite 6 feebly truncate. Gastral sternite 7 transverse rather than crescentic, side apical border with rather long bristles, no fenestrae but sometimes a little thinner on oval areas each side of mid-line. Gastral sternite 8 produced into a wide, almost parallel-sided process, apex just rounded, angles rounded, with a very large area of dense short hairs, no fenestrae but a thickened central line. Genitalia of moderate size ; stipes with no definite impressions ; sagitta in dorsal view narrow, not much desclerotized, apex hardly bent down, usually with small, outwardly directed, pointed hook and no flange, but in *B. pascuorum* (Scopoli) with a long, narrow, serrate flange, sagitta in side view very wide at base, then narrower with an emargination before the central tooth, beyond this narrow to apex ; spatha narrowing very soon behind base, mostly about one and a half times as wide as sagitta ; squama generally large, subquadrate with outer edge rounded to apex, details varying specifically but inner side produced obliquely into a downwardly directed acute plate or spike ; lacinia wide but not very long, not projecting much beyond squama, inner edge at apex produced into a small process and at centre into a spike or a narrow, truncate process, bristles short and not dense ; volsellar area with some long bristles posteriorly.

Illustrations. Sting—Richards, 1927 : figs. 50, 51, 52, 53 ; Hazeltine & Chandler, 1964 : pl. 5. Gastral sternites 7 and 8—Radoszkowsky, 1884 : figs. 20c, 21c, 22c ; Richards, 1927 : figs. 22, 24 ; Pittioni, 1939a : pl. 1, figs. 4, 5, 6, pl. 2, figs. 1, 2, 3. Genitalia—Radoszkowsky, 1884 : figs. 20 a, b, 21 a, b, 22 a, b ; Krüger, 1920 : pl. 5, figs. g, f, h, pl. 6, figs. k, l ; Richards, 1927 : figs. 28, 29, 30, 31, 32 ; Pittioni, 1939a : pl. 1, figs. 4, 5, 6, pl. 2, figs. 1, 2, 3.

EUROPE to JAPAN, TIBET, but probably not south of the Chinese boundaries.

## 32. ***MUCIDOBOMBUS*** Skorikov, 1922

*Exilobombus* Skorikov, 1922 of which I have not been able to examine the male, may prove to be a synonym. As in the other groups allied to *Thoracobombus*, the males of *Mucidobombus* are rather distinctive but the females are difficult to separate subgenerically.

♀. Ocelli separated by rather more than three diameters from eyes, lying just in front of postocular line. Frons rather closely punctured, more strongly and less closely in front of ocelli, unpunctured areas moderately large, well-defined, a wide band of fine sculpture along inner margin of eyes. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 7½ : 3½ : 4, segment 3 rather more than two and a half times as long as broad. Clypeus elongate, moderately swollen, with scattered, not at all close, fine punctures, apical impressions feeble but with a narrow deeper strip with close, moderately large punctures. Labrum with tubercles flattened, inner ends moderately raised, rounded-angular, furrow moderately deep, not broad, narrower than length of antennal segment 3, lamella half the width of labrum, feebly curved, rather thin. Mandibles with almost no incisura, sulcus obliquus strong. Malar space somewhat longer than broad (= 11), not quite as long as antennal segments 2 + 3, a considerable number of scattered, minute punctures. Mid basitarsus strongly spinosely produced. Hind tibia with corbicular surface scarcely reticulate, a little convex towards base, inner apical dorsal angle acutely produced. Hind basitarsus with dorsal angle acute, all bristles short and not numerous. Gastral tergite 6 shining, weakly granulate. Sting with outer thickenings of sheath rather narrow, even dorsally, inner thickenings developed for whole length, very gradually widening upwards, widest just before the top and for a short distance below this somewhat blackened, membrane undifferentiated. Wings lightly infuscate, darker towards tip.

♂. Relatively small. Eyes not swollen, ocelli separated by three diameters from eyes, lying on postocular line. Antennae with segments 3 : 4 : 5 : 8 = 6½ : 3½ : 7 : 7½, penultimate segments a little curved. Mandibles with one broad ventral and a small dorsal tooth, beard long and dense. Malar space distinctly longer than broad (= 10), nearly as long as antennal segments 3 + 4, with scattered fine punctures. Mid basitarsus moderately long and parallel-sided (= 31 × 9), apical dorsal angle acute, fringes short. Hind tibia distinctly clavate, convex, only a small distal disk bare though the hairs are not long elsewhere, dorsal fringe very long. Hind basitarsus short and broad (= 35 × 13), dorsal apical angle acute, fringes very short. Gaster with long, rather dense hairs, moderately shining with rather close coarse punctures and some cross-striation. Gastral sternite 6 with apex rounded, a little thickened. Gastral sternite 7 transversely crescentic, apex rounded, with scattered short bristles, no lines or fenestrae. Gastral sternite 8 produced into a moderate process which is distally parallel sided, apex truncate, angles rounded, a large patch of hairs posteriorly, proximal half with two parallel lines on disk with a small fenestra between them. Genitalia relatively long ; stipes wide with feeble, ill-defined inner impressions ; sagitta narrow in dorsal view, curved down at apex where pointed though not very acutely, no flange or serration, in lateral view about twice as wide, no ventral emargination or tooth, but a slight projection at proximal end of subapical flange ; spatha small, strongly narrowing posteriorly, at middle about as wide as sagitta ; squama large, transverse, outer and posterior margins forming a continuous curve, anterior inner end produced forwards and then obliquely downwards and backwards in a broad but acute spike ; lacinia very long and broad, generally finger-shaped but in centre of inner margin with a wide lobe, defined at each end by a small tooth, the posterior one very acute, end of lacinia subacute, inner edge and ventral surface with dense, quite long pubescence ; volsella region relatively bare.

Illustrations. Sting—Text-fig. 37. Gastral sternites 7 and 8—Pittioni, 1939a : pl. 2, fig. 5. Genitalia—Krüger, 1920 : pl. 5, fig. e ; Pittioni, 1939a : pl. 2, fig. 5.

EUROPE, WESTERN ASIA.

## 33. *SUBTERRANEOBOMBUS* Vogt, 1911

This subgenus has many species, especially in western and central Asia, and there is a considerable range in structure ; the malar space in particular varies greatly in length. The male genitalia, as far as they are known, though showing good specific differences are of the same general type.

♀. Ocelli separated by three diameters from eyes, lying about on the postocular line. Frons closely and rather finely punctured, unpunctured areas moderately large, well-defined, a wide band of fine sculpture along inner margin of eye. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 about = 9 : 4 : 6, segment 3 from rather under to fully three times as long as broad. Clypeus elongate, swollen, either little punctured or (*B. fragrans* (Pallas) ) closely and finely punctured throughout, apical impressions feeble, little punctured or (*B. difficillimus* Skorikov) closely and finely punctured. Labrum with tubercles smooth, flattened and considerably rounded or (*B. fragrans*) considerably more raised and angled at inner end, furrow rather wide, about three-quarters as wide as length of antennal segment 3, lamella moderately wide, curved. Mandibles with no incisura, sulcus obliquus strong. Malar space usually elongate or even very elongate, longer than antennal segments 2 + 3, about = 3 + 4 + 1/3 5 (= 15), but in *B. fragrans* hardly more than quadrate and about as long as antennal segments 2 + 3 (= 13). Mid basitarsus with its dorsal apical angle usually with a relatively short and broad spinose production. Hind tibia with corbicular surface shining, inner dorsal apical angle acute but relatively short and broad. Hind basitarsus with dorsal apical angle not very acute, bristles all short. Gastral tergite 6 not modified, more or less coarsely granulate, sometimes with a furrow on the posterior half. Sting with outer thickenings of sheath of even width, relatively narrow, inner thickenings rather strongly widened in a very even curve, widest at about the middle, a strong black patch just above this, membrane on each side thrown into a strong fold which extends down to the middle and almost touches both the inner thickening and its fellow from the other side. Wings evenly infuscate, sometimes strongly.

♂. Relatively small. Eyes not swollen, ocelli separated by three diameters from eyes, lying just in front of postocular line. Antennae long or very long, segments 3 : 4 : 5 : 8 = 7–8 : 5 : 7½–8 : 8, penultimate segments somewhat or scarcely curved. Mandibles with a broad ventral and small dorsal tooth, beard long and dense. Malar space elongate, as long or longer than antennal segments 3 + 4 (= 11 or more), surface unpunctured. Mid basitarsus moderately long and parallel-sided (40 × 10 or 46 × 12), dorsal apical angle about a right angle, fringes short. Hind tibia with distal half flattened or even concave, covered either with short, not very close bristles, or with a considerable bare disk, fringes short or dorsal fringe long. Hind basitarsus relatively long and parallel-sided (= 41 × 13 or 47 × 13), dorsal apical angle just acute, bristles short. Hairs of gaster long or short, not very dense. Gastral sternite 6 with apex gently rounded, not thickened, with a dense, short, postapical fringe. Gastral sternite 7 widely and broadly crescentic with scattered bristles and closer short hair on disk, no lines or fenestrae. Gastral sternite 8 with a wide tongue-shaped process on central third, sides almost parallel, apex just emarginate, with dense short hairs, two weak parallel lines but no fenestrae. Genitalia rather large ; stipes with a deep, wide, sharp-edged, inner impression ; sagittae in dorsal view generally narrow, apex a little curved downwards, a slight broadening at a lower level near centre and apex outwardly triangularly widened or with a triangular pointed flange, sagitta in side view broad on the basal half or rather more, then narrowed and emitting a process ending in two or three small points ; spatha narrow, almost parallel-sided, about as wide as sagitta ; squama transverse or transversely S-shaped, all angles, or at least the external ones, rounded, inner side sometimes produced into a vertical lamella which looks sharp in dorsal view ; lacinia little or moderately projecting beyond squama, rather narrow, a little curved inwards, end pointed or almost rounded, sometimes with a small apical tuft ; volsellar region with short dense bristles.

Illustrations. Sting—Franklin, 1913 : fig. 157 ; Richards, 1927 : fig. 49 ; Hazeltine & Chandler, 1964 : pl. 6. Gastral sternites 7 and 8—Radoszkowski, 1884 : figs. 26c, 36c ; Franklin, 1913 : fig. 138 ; Pittioni, 1939a : pl. 1, fig. 2. Genitalia—Radoszkowski, 1884 : figs. 26a, b, 36a, b ; Franklin, 1913 : fig. 157 ; Krüger, 1920 : pl. 5, figs. c, d ; Richards, 1927 : fig. 27 ; Pittioni, 1939a : pl. 1, fig. 2.

EUROPE, ASIA to the HIMALAYAS, N. AMERICA.

## 34. ***RHODOBOMBUS*** von Dalla Torre 1880

*Pomobombus* Krüger, 1917

♀. Ocelli separated by three diameters from eyes, lying just in front of postocular line. Frons finely, mostly not very closely punctured, a large area in front of median ocellus without punctures, unpunctured areas large but well-defined, a narrow band of fine punctures along inner margin of eye. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = 9 : 4 : 4½, segment 3 two and a half times as long as broad. Clypeus elongate, moderately swollen, finely and rather sparsely though generally punctured, apical impressions small and narrow but rather well-defined, with a few close larger punctures, mostly in transverse rows. Labrum with tubercles somewhat flattened and rather rounded, furrow of moderate width, about three-quarters as wide as length of antennal segment 3, lamella wide, gently curved. Mandibles with no incisura, sulcus obliquus strong. Malar space elongate, about as long as antennal segments 2 + 3 (= 13½), with a certain number of scattered fine punctures. Mid basitarsus with its dorsal apical angle acutely spinose or in some American species only somewhat angled. Hind tibia with corbicular surface somewhat convex on posteroventral part, surface bare, weakly reticulate, inner dorsal apical angle not or scarcely produced. Hind basitarsus spinosely produced at dorsal apical angle, bristles short. Gastral tergite 6 finely granulate, moderately shining. Sting with outer thickenings of sheath rather narrow but somewhat widened above, inner thickenings evenly widened for most of their length, edge somewhat emarginate above. Wings usually moderately infuscate.

♂. Size moderate. Eyes normal, ocelli separated by three diameters from eyes, lying just in front of postocular line. Antennae rather long, segments 3 : 4 : 5 : 8 = 6 : 4 : 7 : 7½, penultimate segments hardly curved. Mandibles with a broad ventral and a small dorsal tooth, surface granulate and dull, beard not developed. Malar space elongate, about as long as antennal segments 3 + 4 (= 9½), with scattered very fine punctures. Mid basitarsus moderately long and parallel-sided (34 × 8), dorsal apical angle a rounded right-angle, fringes short. Hind tibia thick and little clavate, surface convex and shining with scattered punctures and some cross-striation, with hairs over whole surface, fringes not dense nor longer than its width. Hind basitarsus moderately broad and parallel-sided (37 × 13), dorsal apical angle acute, fringes short. Gaster with close moderately short hairs. Gastral sternite 6 slightly thickened and truncate with a short subapical fringe. Gastral sternite 7 somewhat produced in a broad triangle with rounded apex, well behind apex darker transverse band running parallel to margin, moderate bristles arising on and before the band, no lines or fenestrae. Gastral sternite 8 narrowly transverse with a strongly produced parallel-sided process, angles rounded, apex bifid though the emargination partly filled in by transparent membrane, with tufts of moderate bristles on each side, a pair of parallel lines on disk. Genitalia of moderate size ; stipes with well-defined inner impression of half its width ; sagittae in dorsal view rather narrow, not at all desclerotized, apex a little bent down, curved outwards into a truncate hook whose anterior end forms a small acute tooth, in side view at least twice as wide with a well-marked emargination after base and a strong acute tooth at middle ; spatha moderately broad, gradually narrowing posteriorly, at centre one and a half times as wide as sagitta ; squama transverse, outer edge curving obliquely inwards and ending in a stout acute process at inner posterior dorsal corner, inner edge from anterior inner corner produced obliquely downwards and backwards into a twisted plate of the end is hardly acute ; lacinia projecting a moderate distance beyond the squama, narrowing to apex and then expanded inwards into a small tooth, lacinia almost bare, no dense bristles on volsellar area.

Illustrations. Sting—Richards, 1927 : fig. 48 ; Hazeltine & Chandler, 1964 : pl. 5. Gastral sternites 7 and 8—Radoszkowski, 1884 : figs. 18c, 19c, 27c ; Pittioni, 1939a : pl. 1, fig. 3. Genitalia—Radoszkowski, 1884 : figs. 17a, b, 18a, b, 19a, b, 27a, b ; Krüger, 1920 : pl. 5, fig. b ; Richards, 1927 : fig. 26 ; Pittioni, 1939a : pl. 1, fig. 3.

EUROPE to IRAN and CENTRAL ASIA but not beyond the HIMALAYAS or in CHINA.

## 35. ***FERVIDOBOMBUS*** Skorikov, 1922

This is a large and varied subgenus with a considerable range of structure amongst the species ; moreover several of them are not available in England.

♀. Ocelli separated by three diameters from eyes, lying just in front of postocular line. Frons swollen in front and coarsely punctured (closeness varying with the species), very closely and finely punctured behind, unpunctured areas rather large and ill-defined, a rather wide band of fine punctures along inner margin of eye. Dorsal furrow of gena absent. Antennal segments 3 : 4 : 5 = *c*. 9 : 4 : 6, segment 3 two to two and a half times as long as broad. Clypeus elongate, swollen, rather strongly and closely punctured, especially at sides, disk below rather widely unpunctured or with fine punctures, a line of several rows of fine punctures on mid line of dorsal third, apical impressions rather distinct with a few but large close punctures. Labrum with tubercles little raised, flattened and rounded, furrow rather narrow, not as wide as length of antennal segment 3, lamella wide, shining, thickened, edge nearly straight. Mandibles with no incisura, sulcus obliquus strong. Malar space quadrate to elongate, (13–18), from about as long as antennal segment 3 to rather longer than 2 + 3, usually with some fine punctures. Mid basitarsus with apical dorsal angle not or very feebly spinose produced into a relatively wide angular process. Hind tibia corbicular surface bare, feebly reticulate, with posterior ventral part convex, sometimes subangular in proximal part, inner dorsal apical angle not or little produced. Hind basitarsus not very acutely produced, bristles short. Gastral tergite 6 shining, feebly granulate. Sting variable, outer thickenings of sheath usually much wider above than below, inner thickenings strongly widened below then narrowing from about the midpoint where there is a large blackened area, membrane above thrown into a convex central fold. Wings usually strongly darkened.

♂. Size moderate. Eyes normal, ocelli separated by three diameters from eyes, lying just in front of postocular line. Antennae long, segments 3 : 4 : 5 : 8 = *c*. 7 : 4½ : 8 : 8½, penultimate segments a little curved. Mandibles with broad ventral and small dorsal tooth, beard long, dense and brown. Malar space quadrate to rather elongate (= 11–14), usually a little longer than antennal segments 3 + 4, with scattered fine punctures. Mid basitarsus rather long and parallel-sided (44 × 9) dorsal apical angle rounded right-angle, fringes short. Hind tibia not very long, convex, hairy all over, coarsely cross-striate and obliquely punctured, fringes short. Hind basitarsus parallel-sided and rather broad (48 × 16), apical dorsal angle a right angle, fringes short. Gaster with hairs rather short and even. Gastral sternite 6 with end rounded and a little thickened. Gastral sternite 7 very broadly crescentic posteriorly rounded, with two distinct discal patches of short bristles, no lines or fenestrae. Gastral sternite 8 with central quarter produced into a wide, almost parallel-sided tongue-shaped process, apex slightly emarginate, with a large area of dense short bristles, a central line which forks a little before the bristle patch. Genitalia of moderate size ; stipes with a moderately well-defined impression of half its width ; sagitta seen from above narrow, not bent down until just before apex where bent outwards into a hook-like structure of which the outer margin is straight-serrate, in side view sagitta considerably broader on basal half up to the mid-ventral tooth, then relatively narrow ; spatha narrow, sides not convergent, at centre about twice as wide as sagitta ; squama transverse, outer and posterior edges forming a continuous curve to a blunt exterior point on outer edge of stipes, inner margin produced into a vertical, plate-like anterior lamella and a more dorsal wider rounded process ; lacinia produced a very little way beyond squama, strongly widened at apex, angularly produced at outer end and into a small curved hook at inner end, volsellar region with dense bristles.

Illustrations. Sting—Moure & Sakagami, 1962 : fig. 3 ; Hazeltine & Chandler, 1964 : pl. 3. Gastral sternites 7 and 8—Radoszkowski, 1884 : fig. 28c ; Franklin, 1913 : figs. 32, 101, 126, 132, 148, 174 ; Moure & Sakagami, 1962 : fig. 4. Genitalia—Radoszkowski, 1884 : figs. 28a, b ; Franklin, 1913 : figs. 66, 70, 78, 102, 156, 159–164, 166–168, 170–171, 179, 182–183, 193, 196 ; Moure & Sakagami, 1962 : figs. 5, 6.

NORTH and SOUTH AMERICA.

## KEYS TO THE SUBGENERA OF *BOMBUS* LATREILLE

It is very difficult to make practical keys to the subgenera of *Bombus*, especially in the female sex. Apart from the intrinsic difficulties, few authors have seen more than a fraction of the species. There are of course also many nomenclatorial problems and points of doubt at the specific and subspecific level, though these do not affect a subgeneric key in principle. The keys which I have constructed are tentative and I would not claim that an inexperienced entomologist would find them very useful ; even the expert will find that some species are troublesome and they may also detect errors. Nevertheless, no really comparable attempt has been made before and I hope that it may constitute a foundation for more successful efforts in the future. It is impossible at the moment to make useful keys to the worker caste, which is far too variable and often lacks the diagnostic characters of the female. In any district, when a study of the males and females has shown which species are present, it is usually possible to identify most of the workers.

### MALES

♂ of *B. adventor* (Skorikov) and *B. exil* (Skorikov) were not available.

1 Mandibles distally ending in one large ventral and two small dorsal teeth. Antennal segment 4 0·73–0·74, segment 5 0·93 as long as segment 3. Mid and hind basitarsi with long fringes, hind tibia with a bare disk and very long dorsal and ventral fringes. Ocelli separated by three diameters from eyes. Genitalia with spatha very wide but strongly narrowed posteriorly ; squama transverse or quadrate, inner side proximally with a small process separated by a moderate emargination from the posterior lobe ; sagittae hooked inwards, tip blunt, outer side of hook with a considerable flange . . . . . . . . . . . . 2

– Mandibles distally ending in one large ventral and one small dorsal tooth (absent in some *Mendacibombus*) . . . . . . . . . . . . 3

2 Malar space a little shorter than antennal segment 3. Squama rounded-quadrate or with a long, pointed inner process . . . . ***ALPIGENOBOMBUS*** (p. 221)

– Malar space half as long as antennal segment 3. Squama very transverse ***NOBILIBOMBUS*** (p. 222)

3 Sagittae narrow and pointed. Antennae very long, antennal segment 4 1·1–1·4, segment 5 1·5–1·7 times as long as segment 3. Malar space nearly twice as long as antennal segment 3. Mid and hind basitarsi with short fringes, hind tibia bare on disk. Ocelli separated by three to three and a half diameters from eye. (Pakistan to W. China) . . . . . . ***ORIENTALIBOMBUS*** (p. 224)

– If the sagittae are of this type, the ocelli are much closer to the eyes or the hind tibia is hairy, or if there is a small bare disk, the fourth antennal segment is about half as long as the third . . . . . . . . . . . . . . 4

4 Sagittae curved outwards in a rounded hook. Antennal segments 4 and 5 1·2 and 1·5 times as long as segment 3. Ocelli separated by three diameters from eyes. Mid and hind basitarsus without long fringes, hind tibia with a bare disk and long fringes. Gastral sternite 7 strongly produced, sternite 8 with a narrow, parallel-sided, tongue-shaped projection. Stipes with the inner impression very feeble ; squama twice as long as broad. (Europe) . . ***KALLOBOMBUS*** (p. 225)

– Sagitta not curved outwards into a recurved hook. Antennal segments 4 and 5 relatively shorter (4 shorter than 3) except in a few species with short basitarsal fringes . . . . . . . . . . . . . . . 5

5 Antennal segments 4 and 5 0·36–0·56 and 0·48–0·78 times as long as segment 3. Eyes swollen, ocelli separated from them by one diameter or less. Mandibular beard usually not very well developed. Sagittae narrow and pointed, or finger-shaped, only in one group curved inwards with a flange outside the curve (Section ***BOOPOBOMBUS***) 6

– Antennal segments 4 and 5 relatively longer and sagittae usually of a different shape, particularly if the antennae are at all similar. Ocelli usually less close to the eyes . . . . . . . . . . . . . . . . 9

6 Sagittae curved inwards with a small flange on the outside of the curve. Squama rather elongate, inner edge emarginate. Spatha narrow. Gastral sternite 7 long trapeziform, apex deeply emarginate. Gastral sternite 8 strongly produced, production tongue-shaped. Mid and hind basitarsi and hind tibia with short fringes. (S.W. America) . . . . . . ***FRATERNOBOMBUS*** (p. 227)

- Sagittae pointed or finger-shaped. Hind basitarsus with a long dorsal fringe . 7

7 Squama in section V-shaped, formed of two plates set at an angle and joining at their outer edge. Genitalia small, pyriform. Spatha very wide, narrowing distally. Gastral sternite 7 crescentic but with rounded-triangular production. Gastral sternite 8 crescentic, little produced, subtruncate. Mid basitarsus with a fringe as long as its width, fringe of hind tibia long ***CONFUSIBOMBUS*** (p. 228)

– Squama subquadrate, all angles rounded, not V-shaped in section . . . 8

8 Mid basitarsus with fringe mostly short, hind tibia with long fringes. Antennal segment 3 unusually long. Gastral sternite 7 crescentic, sternite 8 produced, sides a little rounded, apex distinctly emarginate. Spatha about twice as wide as sagitta. (Mountains of Eurasia) . . . . ***MENDACIBOMBUS*** (p. 229)

– Mid basitarsus with a long fringe, hind tibia with very short ones. Gastral sternite 7 broadly triangular, apex feebly emarginate, sternite 8 broadly triangular with apex deeply emarginate. Spatha very wide, 5 times as wide as sagitta. (N. America) . . . . . . . . . . . ***BOMBIAS*** (p. 230)

9 Sagittae in the form of wide sinuate vertical plates. Lacinia projecting very little beyond squama which on inner side has a deep anterior emargination of which the proximal bounding lobe is linear. Spatha very wide. Mid and hind basitarsi

with short fringes, hind tibiae with a bare disk and both fringes long. Ocelli separated by three diameters from eyes. Antennal segments 4 and 5 0·7 and 0·9 times as long as segment 3. (Eurasia and N. America) . ***BOMBUS*** s.s. (p. 226)

– Sagittae of a quite different form . . . . . . . . . . . . 10

10 Sagitta ending in a strong, inwardly directed, recurved hook. Mid basitarsus with short fringes. Antennal segment 5 longer or (in *Separatobombus*) just shorter than 3 . . . . . . . . . . . . . . . . . 11

— Sagitta rarely ending in a strong, inwardly directed, recurved hook and if so the mid basitarsus with a long fringe . . . . . . . . . . . 16

11 Ocelli separated by less than one diameter from eyes. Malar space shorter than antennal segment 4. Hind basitarsus with a long fringe. Sides of spatha strongly convergent posteriorly. Squama a small or rather small rounded triangle, lacinia hardly projecting beyond it. (America) . . . . . . 12

— Ocelli separated by more than one diameter from eyes. Malar space as long or longer than antennal segment 3. Sides of spatha subparallel, little convergent posteriorly. Sagitta ending in a more or less rounded, blunt-ended hook . . 13

12 Sagitta ending in a rounded hook, tip not acute. Impression of stipes wide but ill-defined. Antennal segment 5 shorter than 3. Gastral sternite 7 trapeziform, apex feebly emarginate, sternite 8 subtriangular . ***SEPARATOBOMBUS*** (p. 231)

— Sagitta with a somewhat smaller hook, tip acute. Impression of stipes wide and well-defined. Antennal segment 5 longer than 3. Gastral sternite 7 subcrescentic, sternite 8 with a parallel-sided, tongue-like projection ***CROTCHIIBOMBUS*** (p. 231)

13 Squama considerably longer than broad, inner side emarginate, lacinia also elongate and projecting well beyond it. Impression of stipes strong, sharp-edged. Antennal segment 5 clearly shorter than 3. Hind basitarsus with a long fringe. Ocelli separated by one to two and a half diameters from eyes. Gastral sternite 7 rounded triangular, widely truncate, sternite 8 rounded triangular but slightly truncate or if produced, sides of production strongly divergent. (Eurasia). ***SIBIRICOBOMBUS*** (p. 232)

— Squama not clearly longer than broad, inner side not emarginate. Impression of stipes feebly defined. Antennal segment 5 longer than 3. Gastral sternite 7 trapeziform or crescentic.

14 Lacinia scarcely projecting beyond the squama (more so in *B. atrocinctus* Smith) which is small and rounded triangular. Hind basitarsus with a short fringe. Ocelli separated by at least three diameters from eye. Gastral sternite 8 with a parallel-sided, tongue-like projection. (Eurasia, N. America) ***PYROBOMBUS*** (p. 234)

— Lacinia very long, projecting well beyond the squama. Ocelli separated by less than three diameters from eyes. Gastral sternite 8 widely subtriangular . . 15

15 Squama just transverse with inner side emarginate. Hind basitarsus with a short or long fringe. Malar space not longer than antennal segment 3. Ocelli separated by one and three quarters to two and a quarter diameters from eyes. (Eurasia and N. America) . . . . . ***CULLUMANOBOMBUS*** (p. 233)

— Squama S-shaped, inner end pointed, almost the whole of it lying inside the inner margin of the stipes. Hind basitarsus with a short fringe. Malar space longer than antennal segment 3. Ocelli separated by two and a half diameters from eyes. (E. Asia) . . . . . . . . ***RUFIPEDIBOMBUS*** (p. 238)

16 Mid and hind basitarsi with long fringes . . . . . . . . . 17

— Mid and hind basitarsi with short fringes. Ocelli separated by three diameters from eyes. Malar space more or less elongate (Section ***ODONTOBOMBUS***) 23

17 Sagitta at end not curved inwards or outwards but with two external teeth, one of which is sometimes small. Antennal segment 4 not much shorter than 3, 5 one and a quarter times longer than 3. Malar space in most species distinctly longer than antennal segment 3. Gastral sternite 7 crescentic, 8 subtriangular.

Spatha wide, sides strongly converging ; stipes with no inner impression ; squama longer than broad ; lacinia very long, apex on inner side produced into a feeble, rounded, serrate lobe. (Arctic-Alpine in Eurasia & N. America but not in mountains of S.E. Asia) . . . . . ***ALPINOBOMBUS*** (p. 239)

— Sagitta sometimes curved inwards but never with more than one outer tooth. Antennal segment 4 not more than three quarters as long as segment 3, 5 not more than one tenth longer than segment 3. Malar space rarely longer than antennal segment 3. . . . . . . . . . . . . . . 18

18 Lacinia projecting far beyond squama. Malar space as long as antennal segment 3 or a little longer. Sagitta with a sharp projection on inner side of apex. Antennal segment 4 0·57, segment 5 about 0·80 as long as segment 3. (Eurasia) . 19

— Lacinia relatively short, projecting at most a moderate distance beyond the squama which has rounded angles and an inner emargination. Malar space usually shorter than antennal segment 3. Ocelli separated by two diameters or less from eyes. (S. America) . . . . . . . . . . . . 20

19 Squama completely fused with the stipes, produced into a long acute process directed downwards and backwards. Sagitta at apex with a small pointed flange on inside and a large pointed one on outside. Gastral tergite 7 widely trapeziform, 8 with a parallel-sided projection. Stipes with a broad, sharp-edged impression. Lacinia twisted so that its plane is oblique distally, with dense short hairs at apex and on inner side. Ocelli separated by three diameters from eyes. (Himalayas) ***PRESSIBOMBUS*** (p. 237)

— Squama separate from stipes, rounded-transverse with a small, proximal inner process. Sagitta with an acute apex and an acute inner flange (half arrowhead). Gastral tergite 7 crescentic, 8 broadly triangular. Stipes narrow without an inner impression. Lacinia not twisted, with few hairs. Ocelli variable, separated by 1–3 diameters from eyes. (Eurasia). . . ***MELANOBOMBUS*** (p. 236)

20 Antennal segment 5 a little longer than 3. Impression of stipes wide and deep. Spatha relatively narrow, about one and a half times as wide as sagitta, sides not very convergent posteriorly . . . . . . . . . . 21

— Antennal segment 5 distinctly shorter than 3. Impression of stipes not more than half its width. Squama rounded transverse, inner side emarginate . . . 22

21 Sagitta curved inwards at apex with a serrate flange on the outside. Spatha narrow, sides subparallel. Squama very transverse, widening inwards, inner edge emarginate. Lacinia with a rounded-angular projection on the inner edge, inner corner of apex with a long curved hook. Gastral sternite 7 crescentic, 8 with a tongue-like projection whose sides converge. Malar space hardly more than half as long as antennal segment 3. Ocelli separated by less than one diameter from eyes . . . . . . . . . . . ***ROBUSTOBOMBUS*** (p. 240)

— Sagitta slightly curved inwards at apex and with a small inner tooth. Squama rounded quadrangular with a large subcircular inner emargination. Lacinia wide, posterior end with a short hook, end with a dense tuft of relatively long bristles. Gastral sternite 7 transverse with central quarter produced, 8 subtriangular. Malar space a little shorter than antennal segment 3. Ocelli separated by one and a half diameters from eyes . ***RUBICUNDOBOMBUS*** (p. 241)

22 Stipes with strong impressions. Sagitta with a somewhat inward-curving pointed hook on inside and a narrow serrate flange outside. Lacinia short, apex with a small posteriorly directed hook, outer and ventral side with dense short hairs. Gastral sternite 7 transverse, apex biemarginate, 8 with a long, parallel-sided process. Malar space slightly longer than antennal segment 3. Ocelli separated by two diameters from eyes . . . . . . ***COCCINEOBOMBUS*** (p. 243)

— Stipes with small ill-defined depressions. Spatha wide with strongly convergent sides. Sagitta with apex hooked inwards, externally with a serrate flange. Lacinia moderately long, apex with small hook-like projection at inner end.

Gastral sternite 7 crescentic, weakly emarginate, 8 subtriangular. Malar space three quarters as long as antennal segment 3. Ocelli separated by less than two diameters from eyes . . . . . . ***FUNEBRIBOMBUS*** (p. 244)

23 Lacinia long and narrow, produced inwards at apex into a process like a toe and heel. Sagitta narrow, outer side distally strongly serrate (character otherwise seen only in *B. pascuorum* (Scopoli)—*Thoracobombus*), no tooth beneath. Squama forming a large elongate, vertical, curved plate on inner side two thirds enclosing an oval space, anterior lower corner produced upwards into a sharp spike. Malar space as long as antennal segments 2 + 3 + 4. (Eurasia) ***MEGABOMBUS*** (p. 246)

— Lacinia long and narrow, produced inwards at apex into a spur-like process with several points. Sagitta narrow, sinuate, with an apical outer flange forming a small tooth at its proximal end, emarginate beneath but not forming a real tooth. Squama narrow and transverse, posterior inner corner produced into a thumb-shaped process, anterior inner corner with a long curved hook, extending as far back as posterior margin. Malar space as long as antennal segments 2 + 3. (E. Asia) . . . . . . . . . . ***DIVERSOBOMBUS*** (p. 247)

— Lacinia at apex produced at most into a small hook or serrate, rounded lobe. In *Senexibombus*, somewhat similar to *Megabombus*, but the sagitta is serrate only at the recurved distal quarter . . . . . . . . . . . . 24

24 Antennal segment 5 much (× 1·5–1·9) longer than segment 3 . . . . . 25

— Antennal segment 5 little (× 1·0–1·3) longer than segment 3 . . . . . 27

25 Antennal segment 4 less than 0·7 times as long as 3. Spatha very narrow. Squama very large, transversely oblique, proximal inner end produced into a large hook, beneath this hook can be seen a downwardly directed bifid process, the outer division longer and more acute than the inner one. Sagitta narrow, outer side serrate on distal quarter, first tooth of serrations large, beneath with a strong angle rather than a tooth. Malar space nearly as long as antennal segments 3 + 4. (E. Asia) . . . . . . . . . . ***SENEXIBOMBUS*** (p. 248)

— Antennal segment 4 as long as or longer than segment 3. Spatha very broad with convergent sides . . . . . . . . . . . . . . . . 26

26 Lacinia very wide, not extending far beyond outer part of squama, on inner side proximally with a very long acute hook, inner edge behind the hook straight truncate, somewhat serrate, with long bristles. Squama with elongate outer lobe set in an oblique plane, on inner side at a lower level produced into two very long acute processes, directed obliquely forwards and backwards respectively. Sagitta apically with an outer feebly serrate flange, beneath with a tooth. Malar space about as long as antennal segments 3 + 4. Gaster very closely punctured. (E. Asia) . . . . . . . . . . ***TRICORNIBOMBUS*** (p. 249)

— Lacinia very long, broadly digitiform, near centre on inner side produced into a strong, parallel-sided process with an expanded end with sharp angles. Squama with large, outer part pale and submembranous, generally transverse but posteriorly produced on inside into a rounded lobe, before this deeply emarginate and then produced into a large subcircular lobe (mainly in a vertical plane) with its dorsal edge serrate and the whole attached to the squama by a narrow stalk. Sagitta narrow, simply pointed at apex, not toothed beneath. Malar space as long as antennal segment 4. (Eurasia) . . . . . ***LAESOBOMBUS*** (p. 251)

27 Sagitta at end somewhat hooked inwards and on outer side with two large teeth, mid-point beneath with bifid or trifid tooth. Stipes with wide, sharp-edged impressions. Inner edge of squama not emarginate, anterior inner corner sometimes produced into a vertical lamella. Hind tibial fringe long or short (Holarctic) . . . . . . . . . ***SUBTERRANEOBOMBUS*** (p. 257)

— Sagitta curved or hooked outwards, or pointed, or in one species serrate . . 28

28 Malar space normally a little longer than antennal segments 3 + 4. Sagitta at end curved outwards (except *B. brevivillus* Franklin, *Fervidobombus*), this end-

piece serrate or truncate, beneath with a central tooth. Stipes with rather well-defined inner impressions. Fringe of hind tibia short. . . . . . . 29

— Malar space a little shorter than antennal segments 3 + 4. Sagitta with a small pointed external lobe, or pointed, or serrate. Stipes without any distinct inner impressions. Squama produced inside into an obliquely downwardly directed, acute plate or spike. (Eurasia) . . . . . . . . . . . 30

29 Mandibles without a beard. Squama anteriorly on inside produced obliquely downwards and backwards into a twisted plate of which the end is hardly acute. Lacinia with apex on inside produced into a small lobe with a small tooth. Truncate end of sagitta not serrate. Volsellar region with no very conspicuous bristles. (Eurasia) . . . . . . . . . **RHODOBOMBUS** (p. 258)

— Mandibles with a beard. Squama on inside usually produced into a vertical plate-like anterior lamella and a more dorsal wider rounded process (details vary considerably in different species). Truncate end of sagitta sometimes serrate (in *B. brevivillus* Franklin the sagitta is simply pointed). Lacinia with apex on inside produced into a small hook or angular process. Volsellar region with dense bristles. (N. and S. America) . . . . . **FERVIDOBOMBUS** (p. 259)

30 Lacinia long and broad, finger-shaped, centre of inner edge produced into a wide lobe defined at each end by a small tooth or else simple, inner and often ventral surface with dense, quite long pubescence. Sagitta beneath simple or emarginate but with no distinct tooth . . . . . . . . . . . . . 31

— Lacinia wide but not very long, apex more pointed, pubescence less dense and widespread, centre of inner edge produced into a spike or at least a narrow, truncate process. Sagitta variable but with a central tooth beneath. Fringe of hind tibia long . . . . . . . . . **THORACOBOMBUS** (p. 255)

31 Lacinia with centre of inner edge produced into a wide lobe defined at each end by a small tooth. Sagitta simply pointed, with no tooth or emargination beneath. Hind tibia with a long fringe . . . . . **MUCIDOBOMBUS** (p. 256)

— Lacinia with inner edge straight or feebly concave, with no lobe or process. Sagitta at end hardly acute, with a slight outer, feebly serrate, flange, ventrally bi-emarginate but without a tooth. Fringe of hind tibia short **EVERSMANNIBOMBUS** (p. 252)

## FEMALES

1 Apex of mandibles with six teeth. Mid basitarsus with posterior apical angle more or less clearly acute. Hind basitarsus proximally near ventral margin often with a number of bristles almost as long as the corbicular bristles. Sting-sheath with the outer thickenings rather narrow, of even width ; inner thickenings moderately widened below and gradually narrowed upwards, centre of wide part blackened, membrane between blackened on a lateral lobe projecting down to mid-point . . . . . . . . . . . . . . 2

– Apex of mandibles with one small dorsal tooth and, when an incisura is developed, the ventral corner may also project to some extent. Hind basitarsus normally with no bristles as long as the corbicular bristles [except in *Mendacibombus* and *Pressibombus*] . . . . . . . . . . . . . 3

2 Malar space strongly transverse, shorter than antennal segment 3. Ventral mandibular tooth directed inwards. (Pyrenees and Norway to Himalayas and China) . . . . . . . . . **ALPIGENOBOMBUS** (p. 221)

– Malar space about quadrate, longer than antennal segment 3. Ventral mandibular tooth directed downwards. (Himalayas s.l.) . . . . **NOBILIBOMBUS** (p. 222)

3 Mid basitarsus with posterior apical angle obtuse, more or less rounded. [Except for some *Sibiricobombus*, most of which have the ocelli separated by about two

diameters from eyes ; they also differ from the species of *Subterraneobombus* which they often most resemble in having the whole surface of the auricle of the hind basitarsus densely hairy (Text-fig. 38). *Bombus tanguticus* Morawitz (*Melanobombus*) has the basitarsus produced but has a strong, bare subcircular boss on gastral tergite 6 such is not found in *Odontobombus*] . . . . . . . . 4

– Mid basitarsus with posterior apical angle usually spinose, at least very distinctly acute. Malar space usually at least longer than broad, often distinctly elongate. Ocelli separated by three diameters from eyes. (Section *Odontobombus*) . . 22

4 Outer surface of hind tibia densely reticulate, dull, some long bristles arising from disk down to near its mid-point. Malar space very elongate. Antennal segment 3 fully three times as long as wide in centre. Outer thickenings of sting-sheath very narrow, inner ones very narrow, of even width, no blackened areas. (Pyrenees to Himalayas and other asiatic mountains) . ***MENDACIBOMBUS*** (p. 229)

– Outer surface of hind tibia less coarsely reticulate, rarely if ever so dull, long bristles confined to margins except very near the base or else the malar space is transverse. Antennal segment 3 nearly always shorter . . . . . . . . 5

5 Malar space very long, longer than antennal segments 2 + 3. Antennal segment 3 about four times as long as broad. Lateral ocelli usually separated by not much more than two diameters from eyes. Clypeus usually with rather numerous, scattered, rather fine punctures, apical impressions with dense fine punctures. Mid basitarsus with posterior apical angle somewhat produced. (Some species, see couplet 3, are difficult to separate from some of *Subterraneobombus*, cf. couplet 29.) Outer thickenings of sting-sheath rather narrow, sometimes a little widened above, inner thickenings narrow very little widened below ; membrane brown and convex in a small dorsal region and with a somewhat blackened lobe laterally near centre. (E. Europe to Asia, where mainly in mountains)
***SIBIRICOBOMBUS*** (p. 232)

– Malar space clearly shorter or, if not, antennal segment 3 not so long (about two and a half times as long as broad). Mid basitarsus with posterior angle quite obtuse . . . . . . . . . . . . . . . 6

6 Corbicular hairs unusually dense, tibial surface between them covered throughout with rather sparse but quite distinct, very short feathered hairs. Very large species ; wings usually coloured, dark or yellow brown. Malar space about quadrate. Mandibles with weak or no incisura, no sulcus obliquus. Clypeus generally little punctured, mid line dorsally with many, usually fine, punctures, apical depressions with coarse punctures and sometimes fine ones as well. Punctures of frons all relatively fine, unpunctured areas large. Outer thickenings of sting-sheath narrow but considerably widened above, inner thickenings widened from below to just above middle then narrowed again, edge considerably blackened, adjacent to this on each side a strong, shining, convex fold of membrane. (Himalayas to Formosa and Sumatra) ***RUFIPEDIBOMBUS*** (p. 238)

– Corbicular hairs less dense, tibial surface between them without these short feathered hairs except in a few *Melanobombus* (couplet 8). (*B. coccineus* Friese has short, non-feathered hairs, but gastral tergite 6 has a deep furrow and the unpunctured area of the frons has a band of microscopic punctures.) . . . . . 7

7 Frons with unpunctured areas very large ; most of the area for some distance in front of the ocelli unpunctured and a narrow band of punctures between the ocelli and eyes ; area immediately behind the ocelli also unpunctured. Large species with dark wings. Ocelli separated by three diameters from eyes. Malar space considerably longer than broad, clearly longer than antennal segments 2 + 3, antennal segment 3 two and a half times as long as wide at apex. Mandibles with no incisura. Clypeus with few punctures and these nearly all fine, apical impressions sparsely punctured. Labral lamella straight, wide, but not very clearly defined. Outer thickenings of sting-sheath of moderate, even width ;

inner thickenings moderately wide and gradually narrowing upwards, inner margin blackened for a considerable distance and adjacent membrane also blackened. (Kashmir to S. China) . . . ***ORIENTALIBOMBUS*** (p. 224)

– Frons without this large unpunctured area, especially in front of the ocelli ; or else densely punctured right up to them posteriorly and ocelli closer to eyes . 8

8 Sixth gastral tergite with a bare, convex, more or less rounded boss. Hind tibia with dorsal inner corner not or rarely somewhat produced. Hind basitarsus as a rule with unusually dense, short, feathery hairs. Wings rarely dark, tip not particularly darkened. Malar space about quadrate or, if distinctly longer, the ocelli are separated by two to two and a half diameters from eyes, or the species is very large and dark winged. Antennal segments 3 : 4 : 5 = 8 : 5½ : 6. Frons with quite numerous fine punctures along inner margin of eyes. Outer thickenings of sting-sheath generally narrow but much widened for a short distance dorsally, inner thickenings widened for a considerable distance then narrowed again dorsally, edge sometimes blackened and intervening membranous folds sometimes also blackened. (Europe to India, China and Formosa) ***MELANOBOMBUS*** (p. 236)

– Sixth gastral tergite without a convex rounded boss. Hind tibia with dorsal distal inner corner more or less strongly angularly produced (except in *Kallobombus* and a few *Pyrobombus*—*B. pratorum* (Linnaeus), *B. atrocinctus* Smith). Hind basitarsus rarely so densely haired . . . . . . . . . 9

9 Whole discal surface of hind tibia with scattered but quite numerous short unbranched hairs. Ocelli separated by two and a half diameters from eyes. Frons with unpunctured area moderately large crossed by a wide transverse band of microscopic punctures, inner margin by eye with numerous very microscopic punctures and a few rather large ones. Malar space just transverse. Gastral tergite 6 with a raised boss (almost as in *Melanobombus*) but divided by a deep, well-defined furrow. Outer thickenings of sting-sheath narrow but considerably widened dorsally, inner thickenings narrow but moderately widened, on ventral quarter, not darkened ; membrane dark and rather convex dorsally. (Peru) ***COCCINEOBOMBUS*** (p. 243)

– Hind tibia at least with a considerable distal discal area bare. Frons without a band of microscopic punctures across the unpunctured area. Gastral tergite 6 never with such a deep, well-defined furrow . . . . . . . . . 10

10 Malar space distinctly transverse. Either a definite band of close punctures along inner margin of eyes or ocelli separated by about two diameters from eyes, or both . . . . . . . . . . . . . . . . . . 11

— Malar space elongate, quadrate or just transverse. In the members of *Pyrobombus* with a distinctly transverse malar space, there are no fine punctures along the inner eye-margin and the ocelli are separated by three diameters from eye ; antennal segment 3 clearly shorter than 4 + 5. . . . . . . . . . . 16

11 Ocelli lying just in front of postocular line, separated by three diameters from eyes and corbicular surface of hind tibia entirely bare and shining. Mandibles with a strong incisura, sulcus obliquus moderately distinct. Clypeus strongly punctured on almost its whole surface. Outer thickenings of sting-sheath narrow, widened dorsally for a short distance only ; inner thickenings relatively wide, twice emarginate, the processes so formed more or less bent inwards, membrane undifferentiated. (Eurasia and N. America to Mexico) . ***BOMBUS*** s.s. (p. 226)

— *Either* ocelli not separated by more than two diameters from eyes *or* the proximal half or third of corbicular surface bristly and the whole surface more or less strongly reticulate ; or both these characters present. Mandibles with no or with a weak incisura, sulcus obliquus strong (except in *Crotchiibombus* Franklin). Clypeus sometimes with some sparse large punctures but if punctures are close they are small. . . . . . . . . . . . . . . 12

12 Hind tibia with its corbicular surface bare. Clypeus swollen with fine and rather close punctures. Ocelli separated by two diameters or less from eyes, well in front of postocular line. (U.S.A. and C. America) . . . . . . . . 13

— Hind tibia with proximal half or third of its corbicular surface bristly. (C. and S. America) . . . . . . . . . . . . . . . 15

13 Frons with rather strong, close, punctures along inner margin of eyes. Clypeus elongate, impressions feeble, finely and closely punctured. Labral furrow wide and deep, nearly as wide as length of antennal segment 3. Mandibles with a strong sulcus obliquus. Outer thickenings of sting-sheath moderately wide both above and below, inner thickenings rather strongly widened on lower third and evenly narrowing and running to top at a constant width ; a little darkened where it narrows. Membrane dorsally projecting and produced down each side into an elongate-ovate, blackened lobe. (N. America) ***SEPARATOBOMBUS*** (p. 231)

— Frons rather sparsely punctured all round the ocelli except for a densely punctured area immediately behind them ; unpunctured areas large and ill-defined, without a band of fine punctures near the eye though in *Crotchiibombus* a band of very fine punctures may be seen set rather more discally. Clypeus short, impressions with coarse punctures. Labral furrow deep and narrower. (Mandibles with a weaker sulcus obliquus in *Crotchiibombus*.) . . . . . . . . 14

14 Malar space clearly shorter than antennal segment 3 which is shorter than twice the length of 4. Clypeus more coarsely though shallowly punctured, impressions weaker. Labral tubercles more convex but less angular, furrow deep, rather wider than length of antennal segment 3. Corbicular hairs shorter than half tibial width and dense. Outer thickenings of sting-sheath narrow and of about constant width, inner thickenings considerably widened and blackened on lower third, above this very narrow ; membrane undifferentiated. (N. America) ***FRATERNOBOMBUS*** (p. 227)

— Malar space clearly longer than antennal segment 3 which is nearly as long as twice the length of 4. Clypeus more finely punctured, impressions stronger. Labral tubercles less raised but more angular at inner end, furrow deeper and much narrower than the length of antennal segment 3. Corbicular hairs mostly longer than half the tibial width and less dense. Outer thickenings of sting-sheath rather wide but narrowed in centre, inner thickenings widened for a short distance ventrally, then rather suddenly narrowed and of constant width to the top, considerably blackened on lower half ; membrane with a blackened convex area close to the narrowing of the inner thickenings. (N. and C. America) ***CROTCHIIBOMBUS*** (p. 231)

15 Frons rather closely punctured, with large but well-defined unpunctured areas and a band of fine punctures along inner margin of eyes. Ocelli separated by three diameters from eyes and lying a little in front of postocular line. Clypeus with numerous punctures, mostly rather large, swollen with ventral third flattened. Labral furrow narrow. Hind basitarsus not unusually bristly. Outer thickenings of sting-sheath very wide, inner thickenings gradually widening from below but soon ending in a right-angled truncation, above this widening again in a regular curve, inner margin somewhat blackened, membrane forming two somewhat pyriform, convex, deep brown lobes. (C. and western S. America) ***RUBICUNDOBOMBUS*** (p. 241)

— Frons with large unpunctured or very sparsely punctured areas in front of and around the ocelli, no specially defined unpunctured areas, no band of punctures along inner margin of eyes. Ocelli separated by two diameters from eyes and lying well in front of postocular line. Clypeus strongly swollen, sometimes somewhat flattened ventrally, little or moderately punctured, apical impressions feeble. Labral furrow wide or very wide. Hind basitarsus with bristles on its outer surface longer and more numerous than usual. Outer thickenings of sting-sheath of constant width, moderately broad, inner thickenings considerably widened below and ending in a finger-shaped blackened process, a somewhat similar process projects from above almost to meet it, margin of small area enclosed between these processes also sometimes blackened; intervening membrane sometimes raised into a horseshoe-shaped fold. (C. and S. America) **ROBUSTOBOMBUS** (p. 240)

16 Malar space much or at least distinctly longer than broad, at least as long as antennal segments 2 + 3, often as long as 3 + 4. Clypeus moderately long and swollen, generally but not very coarsely punctured, apical impressions strong, strongly and more or less closely punctured. Antennal segments 3 : 4 : 5 = 9 : 6 : 7. Frons rather finely punctured, especially behind the level of the ocelli, unpunctured areas ill-defined, a rather broad band of fine sculpture along inner margin of eyes. Ocelli separated by three diameters from eyes, just in front of or almost on the postocular line. Inner thickenings of sting-sheath strongly widened below, two isolated blackened spots in the membrane between them. (Alps, N. Scandinavia, Arctic Eurasia, Arctic America, Rockies, Sierras, to Colorado and California) . . . . . . . . . **ALPINOBOMBUS** (p. 239)

— Malar space transverse, quadrate or a little longer than broad, never more than a little longer than antennal segment 3. . . . . . . . . . 17

17 Mandibles with no incisura but with ventral apical angle produced into a small process, sulcus obliquus rather strong. Ocelli separated by two and a half diameters from eyes, rather distinctly in front of postocular line. Labral tubercles convex, angled at inner end, furrow narrow, narrower than length of antennal segment 3. Frons quite closely punctured, unpunctured areas large but well-defined, a wide band of fine punctures along the eyes. Outer thickenings of sting-sheath moderately wide, inner thickenings gradually but not very strongly widened from below, ending in a rounded blackened knob, above this slightly widened again and sending down an ill-defined blackened process towards the knob; lower part and adjacent membrane somewhat blackened, membrane otherwise undifferentiated. (C. and S. America) . **FUNEBRIBOMBUS** (p. 244)

— Mandibles sometimes with an incisura but not with the ventral apical angle produced into a short process . . . . . . . . . . . . 18

18 Labral tubercles little raised and much rounded, furrow shallow and ill-defined. Ocelli separated by two and a half diameters or less from eyes, well in front of postocular line. Mandibles with no incisura and a weak sulcus obliquus. Antennal segment 3 as long as or hardly longer than 4 + 5 . . . . . . 19

— Labral tubercles more or less raised and flattened, inner end more or less angled, furrow deeper and well-defined. Ocelli more widely separated from eyes (except some *Cullumanobombus*). Antennal segment 3 clearly shorter than 4 + 5. Malar space quadrate or more or less transverse. . . . . . . . 20

19 Malar space a little longer than broad and a little longer than antennal segment 3. Clypeus with a wide flattened disk, closely and finely punctured, especially on lower third, impressions ill-defined but closely punctured. Frons mostly closely and rather finely punctured, unpunctured areas well-defined, a wide band of close fine punctures along inner margin of eyes. Outer thickenings of sting-sheath not broad but a little more so above than below, inner thickenings very narrow, membrane convex dorsally and sending down to centre two large blackened lobes on each side. (C. Europe) . . **CONFUSIBOMBUS** (p. 228)

— Malar space about quadrate, about as long as antennal segment 3. Clypeus long, strongly swollen, closely and finely punctured, impressions very weak and not more punctured. Frons moderately strongly and closely punctured, unpunctured areas large and ill-defined, a narrow band of rather fine sculpture along inner margin of eyes. Outer thickenings of sting-sheath a little wider above than below, inner thickenings rather narrow and of almost constant width, edge upturned, especially below, membrane undifferentiated except for some lateral blackening. (N. America) . . . . . . . . . . . . . **BOMBIAS** (p. 230)

20 Ocelli separated by somewhat or distinctly less than three diameters from eyes, well in front of postocular line. Hind basitarsus rather less pubescent than usual. Frons closely and rather finely punctured, unpunctured areas small and well-defined, a wide band of fine sculpture along inner margin of eyes. Mandibles with no incisura and a rather strong sulcus obliquus. Outer thickenings of sting-sheath considerably widened above, inner thickenings rather strongly widened and a little blackened below, two small blackened areas in membrane opposite centre of widened part. (Eurasia, N. and C. America) **CULLUMANOBOMBUS** (p. 233)

— Ocelli separated by fully three diameters from eyes, hardly in front of postocular line . . . . . . . . . . . . . . . . . . . 21

21 Clypeus rather strongly and evenly punctured, impressions strong but not more closely punctured. Frons rather closely punctured, unpunctured areas small and well-defined, a wide band of fine sculpture along inner margin of eyes. Mandibles with no incisura or sulcus obliquus. Hind basitarsus with sparse pubescence and no long bristles. Outer thickenings of sting-sheath moderately wide, especially above, inner thickenings rather strongly widened upwards to above middle then suddenly narrowed, edge of wide part a little blackened, a slight dorsal fold but no black spots in the membrane. (Europe) **KALLOBOMBUS** (p. 225)

— Clypeus, except impressions, largely unpunctured (more strongly and closely in *B. lapponicus* (Fab.). Frons mostly rather sparsely punctured, unpunctured areas ill-defined, no fine punctures along inner margin of eyes, the margin being largely shining. Mandibles with a well-marked incisura but no sulcus obliquus. No long bristles on hind basitarsus which is not usually very densely haired. Outer thickenings of sting-sheath narrow but considerably widened for a short distance dorsally, inner thickenings narrow and scarcely widened or blackened, two large blackened spots in membrane (at least of copulated ♀) (Europe, Asia, including Malayan Archipelago, N. and C. America) **PYROBOMBUS** (p. 234)

— Clypeus with fairly numerous scattered punctures, mostly small but some large. Frons not closely nor coarsely punctured, unpunctured areas not large, ill-defined, no fine punctures along inner margin of eyes, the margin being largely shining. Mandibles with feeble incisura and no sulcus obliquus. Hind basitarsus densely pubescent, lower edge for its whole length and disk in part with long bristles. Outer thickenings of sting-sheath not wide but wider above than below, inner thickenings very wide, widest just above middle and gradually narrowing above and below, considerably blackened, especially near middle ; membrane little differentiated except for a darkened dorsal patch. (Himalayas) **PRESSIBOMBUS** (Frison) (p. 237)

22 Malar space twice as long as antennal segment 3 . . . . . . 23

— Malar space less than 1·30 times as long as antennal segment 3 . . . . . 25

— Malar space 1·40–1·80 times as long as antennal segment 3 . . . . . . 27

23 Antennal segment 3 a little shorter than 4 + 5 ($10\frac{1}{2}$ : 11). Mid line of clypeus dorsally with a slight furrow or line of close punctures. Furrow between labral tubercles narrower. Mid basitarsus acutely spinosely produced. Outer thickenings of sting-sheath rather wide, of fairly constant width, inner thickenings considerably widened below to above the mid point, this part with a blackened edge and ending in a small blackened projection, above this emarginate and then with a rounded projecting lobe of which the base is blackened, membrane between thrown into two longitudinal folds. (Eurasia north and west of Himalayas) **MEGABOMBUS** (p. 246)

— Antennal segment 3 clearly shorter than 4 + 5 (at most $11\frac{1}{2}$ : 13). Furrow between labral tubercles wider. Mid basitarsus with the production wider, hardly spinose. 24

24 Inner dorsal angle of hind tibia not or hardly produced apically. Much of clypeus rather strongly and closely punctured, mid line on dorsal third with several rows of fine punctures (cf. couplet 36). A few species of ***FERVIDOBOMBUS*** (p. 259)

— Inner dorsal angle of hind tibia pointed apically though the point is short and broad. Clypeus finely or little punctured, no rows of punctures on mid line dorsally (cf. couplet 35). . . . Some species of ***SUBTERRANEOBOMBUS*** (p. 257)

25 Frons with large unpunctured areas separated from eyes by a narrow band of close, fine punctures. Malar space unpunctured. Mid basitarsus spinosely produced. Outer thickenings of sting-sheath not wide, a little wider above, inner thickenings moderately widened over most of dorsal half, a little blackened, membrane not differentiated. (Eurasia, north and west of the Himalayas) ***LAESOBOMBUS*** (p. 251)

— Frons with small unpunctured areas, separated from eyes by a wide band of fine punctures . . . . . . . . . . . . . . . 26

26 Mid basitarsus broadly produced. Band of fine punctures along inner edge of eye not spreading over the unpunctured area of frons. Labral lamella not prominent. Malar space with many fine punctures. Outer thickenings of sting-sheath rather narrow but somewhat wider dorsally, inner thickenings narrow but somewhat widened on central two thirds and the margin at the centre somewhat blackened, adjacent membrane also somewhat blackened but otherwise undifferentiated. (E. Europe and W. Asia but not in Himalayas) ***EVERSMANNIBOMBUS*** (p. 252)

— Mid basitarsus spinosely produced. Band of fine punctures along inner edge of eye spreading halfway across unpunctured area of frons. Labral lamella considerably thickened. Malar space unpunctured. Outer thickenings of sting-sheath wide above, narrow below, inner thickenings moderately wide on lower half, gradually but much narrowed above, membrane with two indefinite dorsal lobes. (E. Mongolia and Ussuri distr.) . . . . ***EXILOBOMBUS*** (p. 253)

27 Gastral tergites with very close coarse punctures except tergite 6 which has coarse granules. Mid basitarsus acutely spinosely produced. Hind tibia with corbicular surface strongly reticulate. Length malar space : antennal segment 3 = 1·60. Frons with rather small and well-defined unpunctured areas with a wide band of close fine punctures along inner margins of eyes. Outer thickenings of sting-sheath not wide except quite dorsally, inner thickenings very wide and bent inwards, ending rather suddenly dorsally and here somewhat blackened though generally pale brown ; membrane not generally differentiated but with a convex central fold at dorsal end. (Asia, especially north-eastern) ***TRICORNIBOMBUS*** (p. 249)

— Gastral tergites without such close, coarse punctures . . . . . . . 28

28 Frons with no band of close fine punctures along the inner margin of eyes, unpunctured area large and ill-defined. Clypeus closely and coarsely punctured. Length malar space : antennal segment 3 = 1·50. Mid basitarsus acutely spinosely produced. Hind tibia with corbicular surface feebly reticulate. Outer thickenings of sting-sheath rather wide, even wider dorsally, inner thickenings rather narrow with a moderately wide section near centre, above this blackened and the black part with a small downward projection into the membrane from about the middle, intervening membrane thrown into two big folds. (Malaysia, Philippines, Indonesia) . . . . . . ***SENEXIBOMBUS*** (p. 248)

— Frons with a band of close fine punctures along the inner margin of eyes. . . 29

29 Malar space very long and third antennal segment about four times as long as broad. Auricle of hind basitarsus with dense brown pile even on surface not apposed to hind tibia (Text-fig. 38. Inner thickenings of sting-sheath very little widened even below and membrane only with a narrow blackened lateral lobe. Some species of ***SIBIRICOBOMBUS*** (see couplet 5).

— Malar space and third antennal segment shorter. A few species of *Subterraneobombus* (couplet 34) are not very different but in them the auricle (fig. 39) has dense pile only on the surface apposed to the end of the hind tibia and the inner thickenings of the sting-sheath project strongly, are heavily sclerotized, and the intervening membrane has two very large lateral folds. . . . . . . . . 30

30 Mid basitarsus acutely spinosely produced . . . . . . . . . 31

— Mid basitarsus acute but not spinose . . . . . . . . . . 35

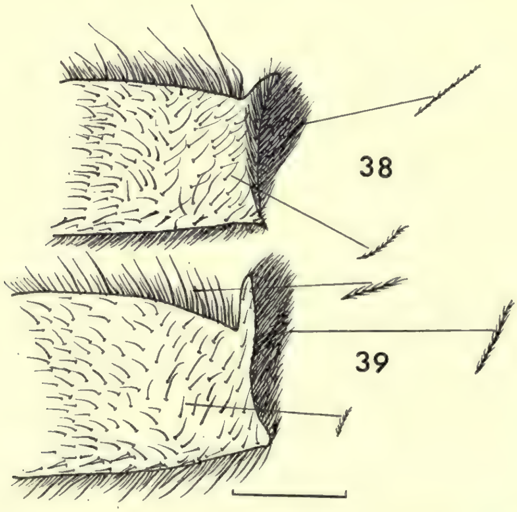
31 Malar space longer, about as long as antennal segments 2 + 3 + 4. Labral furrow narrower and deeper. Inner dorsal angle at apex of hind tibia little produced . 32

— Malar space not longer than antennal segments 3 + 4 ; antennal segment 5 only a little longer than 4. Hind basitarsus quite strongly produced . . . 33

32 Antennal segment 5 clearly longer than 4 which is transverse rather than quadrate and shorter than in any other group of *Odontobombus*. Hind basitarsus little produced apically. Outer thickenings of sting-sheath moderately wide, especially above, inner thickenings strongly almost angularly widened, widest well below middle, not blackened ; membrane hardened and darkened dorsally. (Asia) **DIVERSOBOMBUS** (p. 247)

— Antennal segment 5 very little longer than 4 which is at least quadrate. Hind basitarsus distinctly produced apically. Outer thickenings of sting-sheath somewhat wider dorsally than ventrally, inner thickenings widening very gradually upwards, widest near the top then rather suddenly narrowing, a slight blackening of the edge near the centre ; two small central folds at the top of the membrane. (I have not seen a male of this group and the genitalia do not seem to have been illustrated.) (Asia) . . . . . **ADVENTORIBOMBUS** (p. 254)

33 A large unpunctured area in front of median ocellus, lateral unpunctured areas large but well-defined, band of fine sculpture along inner margins of eye narrow. Antennal segment 3 just longer than 4 + 5. Apical impressions of clypeus small and narrow with close larger punctures, mostly in rows. Inner dorsal angle at apex of hind tibia not or hardly produced. Outer thickenings of sting-sheath rather narrow, only a little wider dorsally, inner thickenings moderately and



Figs. 38–39. Auricle of right hind basitarsus of, 38, *Bombus miniatocaudatus* Vogt ; 39, *B. fragrans* Pallas.

evenly widened over most of their length, thickenings rather dark ; membrane thrown into two small dorsal brown folds. (Eurasia north and west of Himalayas). (cf. also couplet 37) . . . . ***RHODOBOMBUS*** (p. 258)

— Area in front of median ocellus coarsely but not closely punctured, lateral unpunctured areas of moderate size, fairly well-defined, band of fine sculpture along inner margin of eyes wide or rather wide, antennal segment 3 shorter than or as long as 4 + 5. Inner dorsal apical angle of hind tibia more acutely produced. 34

34 Malar space as long as antennal segments 3 + 4. Apical impressions of clypeus rather strong with close, moderately coarse punctures. Labral tubercles flattened, furrow shallow. Outer thickenings of sting-sheath moderately wide, especially above, inner thickenings moderately or rather strongly broadened to the middle or rather higher, the top of the broad part projecting as a slight spur, margin below the broadest part a little blackened, membrane undifferentiated. (Eurasia, north and west of Himalayas) . . . ***THORACOBOMBUS*** (p. 255)

— Malar space not quite as long as antennal segments 2 + 3. Apical impressions of clypeus weak with a narrow deeper strip with close moderately coarse punctures. Labral tubercles somewhat raised and angular at the inner end, furrow moderately deep. Outer thickenings of sting-sheath rather narrow even dorsally, inner thickenings gradually widening upwards for almost whole length, widest just before the top and blackened for a short distance below this ; membrane undifferentiated. (Eurasia, west and north of Himalayas) ***MUCIDOBOMBUS*** (p. 256)

35 Species often large or very large, clypeus swollen with no furrow or lines of punctures on dorsal third of mid line, general surface often but not in all species considerably punctured. Malar space variable, ratio of its length to that of the third antennal segment from 1·43 (*B. fragrans* Pall.) to over 2·10 (*B. difficillimus* Skor.). Hind tibia with inner dorsal apical angle sharp though production rather wide. Outer thickenings of sting-sheath not very wide and of even width, inner thickenings rather strongly widened in a regular curve, widest at about the middle, a sharp black patch just above this ; membrane dorsally on each side thrown into a strong dark fold which touches the inner thickening, about meets its fellow and extends down to mid point. (See also couplet 24.) (Eurasia, N. America)
***SUBTERRANEOBOMBUS*** (p. 257)

— Clypeus with a slight furrow or distinct lines of punctures on mid line of dorsal third. Malar space of medium length or, rarely, rather long. Hind tibia with inner dorsal apical angle not or scarcely produced . . . . . . . 36

36 Clypeus with widespread but sparse fine punctures. Mid basitarsus more spinosely produced. Frons less punctured with a larger area in front of and at sides of ocelli unpunctured. (See couplet 32.) . . . ***RHODOBOMBUS*** (p. 258)

— Clypeus generally with closer and coarser punctures. Mid basitarsus often not very distinctly produced. Frons more punctured, with unpunctured areas smaller. Species often large or very large. Outer thickenings of sting-sheath much wider above than below, inner thickenings strongly widened below, then narrowing from about mid point where there is a large blackened area ; membrane dorsally thrown into a convex central fold. (N. and S. America)
***FERVIDOBOMBUS*** (p. 259)

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D. E. KIMMINS

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BY

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British Museum (Natural History)

*Pp.* 277–305

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# A LIST OF THE TYPE-SPECIMENS OF LIBELLULIDAE AND CORDULIIDAE (ODONATA) IN THE BRITISH MUSEUM (NATURAL HISTORY)

*By* D. E. KIMMINS

## SYNOPSIS

A list of the Libellulid and Corduliid type-specimens in the British Museum (Nat. Hist.) has been prepared. Three hundred and forty-three taxa are dealt with and lectotypes are designated for ninety-seven of these taxa.

## INTRODUCTION

In 1966, following the bequest to the British Museum (Nat. Hist.) of the Fraser collection of Odonata, the author published a list of Fraser's Odonata types in the BM(NH) collections. This produced valuable information and the present work offers a similar list of the type-specimens of Libellulidae and Corduliidae in our collection. The publication of such lists is advocated by the International Commission on Zoological Nomenclature (Rec. 72D(4)) and the preparation of this list has proved both useful and interesting. Certain discrepancies in the labelling and marking of some of the earlier types have come to light and the opportunity has been taken to designate lectotypes in ninety-three cases in which the descriptions were based upon a series of specimens and a type or holotype was not specified by the original author in print. The word LECTOTYPE, in capital letters, indicates a designation of lectotype in this paper.

This list includes not only Fraser's types, dealt with by Kimmins (1966), but also the small number of Fabrician Libellulid types from the Sir Joseph Banks collection, which were studied by Campion (1917). In both these cases, the original type data is not repeated, but reference is made to the appropriate paper in which it may be found.

The general lay-out follows that of Kimmins (1966), each entry beginning with the specific name (in alphabetical order), author, the genus in which it was described, followed by the date and page and figure references. Full references are given at the end of the paper. Next follows the status of the type specimen and the label data, that of each label being separated from the next by an oblique stroke.

Any comments are given in a second paragraph. Square brackets enclose additional information, such as the completion of abbreviated locality names; [WFK] indicates that a label is in Kirby's writing. Type [McL. label] indicates the small, rectangular type-label, usually on mauve or reddish paper, used by McLachlan. BM Register numbers are not given.

In the case of species described by Calvert (1909), it appears to have been his practice to label as TYPE the example figured. These are to be considered as Holotypes. (Calvert, 1901–08 : xxviii).

This list of types was completed in February 1968.

***adolescens*** Kirby **(*Beblecia*)**, 1900 : 71–72, fig. 2. LECTOTYPE ♂ (abdominal segments 5–10 missing). Free Town, Sierra Leone, 13.ix.99, *E. E. Austen*/Beblecia adolescens Kb. type [WFK].

Of the three examples listed by Kirby, only one (the lectotype) bears his determination label, as recorded above, but the other two examples, 1 ♂, 1 ♀, are recognizable by the locality data and are considered to be paralectotypes. No type was designated in print, but the example bearing his determination label has been selected as Lectotype. This specimen has for many years carried a red type label, now replaced by a lectotype label. This taxon is currently considered a synonym of *Crocothemis divisa* Karsch.

***aenea*** Kirby **(*Zygonidia*)**, 1905 : 275–277. Holotype ♂. Tonkin/Zygonidia aenea Kirby, ♂ Holotype, D. E. Kimmins det. 1961.

Currently placed as a synonym of *Zygonyx iris* Selys.

***aequalis*** Kimmins (ssp. ***Rhyothemis phyllis***), 1936 : 78–80, text-fig. 7 and pl. 3. Holotype ♂. New Hebrides, Malekula, Ounua, 21.iii.1929, Miss *L. E. Cheesman*/Rhyothemis phyllis aequalis Kimmins ♂, det. D. E. Kimmins.

***aethiopica*** Kimmins (ssp. ***Atoconeura biordinata***), 1958 : 357–358, figs. 7a–c. Holotype ♂. Ethiopia, Segheria, 25.iii.1948, *K. M. Guichard*/Atoconeura biordinata aethiopica Kim., ♂ Type, D. E. Kimmins det. 1958.

***affinis*** Kirby **(*Neurothemis*)**, 1889 : 323, pl. 54, fig. 2. Holotype ♂. Barang/N. affinis type [WFK].

This specimen has lost its BM register number, so that it is not possible to check the accuracy of the locality label 'Barang', which is in Indochina. It is probably wrongly labelled, since the taxon is currently placed as a synonym of *Erythrodiplax funerea* Hagen, a S. American species.

***alcestis*** Tillyard **(*Rhyothemis*)**, 1906 : 482–483, pl. 44, fig. 1. Holotype ♀ (lacking head). Kuranda, N. Q., *F. P. Dodd*, xii.07/Rhyothemis alcestis Till., ♀ TYPE, R.J.T.

Described from a single example. Currently placed in the synonymy of *Rhyothemis braganza* Karsch.

***allogenes*** Tillyard **(*Agrionoptera*)**, 1908 : 641–643. LECTOTYPE ♂. Cairns, N. Q., iv.05, *E. Allen*/Agrionoptera allogenes Till., TYPE, R.J.T./Agrionoptera allogenes Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as a subspecies of *A. papuensis* Selys.

***amaryllis*** Selys **(*Rhyothemis*)**, 1878 : 299. Holotype ♂ (lacking head). Menado/Type [McL. label]/Lib. amaryllis ♂ Selys.

The unique holotype was originally in the McLachlan collection. Currently placed as a synonym of *Rhyothemis phyllis snelleni* Selys.

***amazonica*** Kirby **(*Ephidatia*)**, 1889 : 331 (pars). LECTOTYPE ♂. Santarem/168/Ephidatia amazonica type [WFK]/Ephidatia amazonica Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

This species was restricted by Ris, 1913 : 1013 to the ♂ and ♀ from Santarem, the ♂ from Para becoming a paratype of *Ephidatia batesi* Ris, 1913. *E. amazonica* Kirby (restr.) is currently considered a synonym of *Idiataphe longipes cubensis* (Scudder).

***amazonica*** Kirby **(*Fylgia*)**, 1889 : 344, pl. 51, figs. 2, 3. LECTOTYPE ♂. Para [label replaced, DEK]/Fylgia amazonica type ♂ [WFK]/Fylgia amazonica Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Kirby's label 'Fylgia amazonica type ♀' had been wrongly attached to an immature ♂ and has been transferred to one of the two ♀ syntypes, both of which lack heads.

***ambiguus*** Kirby **(*Misthotus*)**, 1905*a* : 193. Lectotype ♂ (Kimmins, 1957 : 96–97). C[ape of] G[ood] H[ope]/Misthotus ambiguus cotype [WFK]/Misthotus ambiguus Kirby, ♂ Lectotype, D. E. Kimmins det. 1956.

Currently placed as synonym of *Trithemis dorsalis* (Rambur). The other syntype of *ambiguus* (Transvaal) was placed by Longfield (1936 : 490) as a synonym of *Trithemis risi* Longfield (1936 : 490).

***anomala*** Kirby (***Anatya***), 1889 : 338, pls. 53, fig. 9 and 57, fig. 7. LECTOTYPE ♂. Para/3/ Anatya anomala type [WFK]/Anatya anomala Kirby, Lectotype, D. E. Kimmins det. 1967.

Currently placed as a synonym of *Anatya guttata* (Erichson).

***anomala*** Pinhey (***Trithemis***), 1955 : 38–39, fig. 8. Holotype ♂. Lake Chila, Abercorn, N. R., iv.1954, *E. Pinhey*/Trithemis anomala Pinh. 1954, Holotype/Male and Female in Copula.

***apicalis*** Fraser (ssp. ***Hylaeothemis fruhstorferi***), 1924. Kimmins, 1966 : 178–179.

***apicalis*** Kirby (***Rhyothemis***), 1889 : 319, pl. 51, fig. 5 Holotype ♀. Aneit[yum], *Wallace*/ apicalis type [WFK].

This taxon is currently placed as a subspecies of *Rhyothemis phyllis* (Sulzer).

***apicalis*** Kirby (***Untamo***), 1889 : 331, pl. 53, fig. 4. Holotype ♀. Sul[a]/Sula, *Wallace*/Untamo apicalis type [WFK].

Currently placed as a synonym of *Neurothemis ramburi* (Brauer).

***ardens*** McLachlan (***Thecadiplax***), 1894 : 429–430. LECTOTYPE ♂. Ta-chien-lu/Type [McL. label]/Thecadiplax ardens McL./Thecadiplax ardens McL , ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as a subspecies of *Sympetrum eroticum* (Selys).

***armstrongi*** Fraser (ssp. ***Rhyothemis regia***), 1956. Kimmins, 1966 : 179.

***arsinoe*** Lieftinck (***Diplacina***), 1953 : 171–173, fig. 6. Holotype ♂. Papua, Kokoda, 1,200 ft., viii.1933, *L. E. Cheesman*/Diplacina arsinoe sp. n. Holotype, det. M. A. Lieftinck, 1947.

***atra*** Pinhey (***Trithemis***), 1961 : 166–167, pl. 11, fig. 14. Holotype ♂. Uganda, Masindi Port, 25.iv.1956, *P. S. Corbet*/Trithemis atra Pinh., 1956, ♂ Type.

***attenuata*** Kirby (***Trithemis?***), 1889 : 328, pl. 53, fig. 2. LECTOTYPE ♂. Amaz[on]/ Trithemis attenuata type ♂ [WFK]/Trithemis? attenuata Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Kirby gives as locality 'Santarem', but the locality labels on the specimens marked by him as ♂ and ♀ types are 'Amaz[on]', and one of the paratypes is labelled as 'Braz.'. In this case I am not interpreting the locality strictly as given in the description but have selected the ♂ labelled by Kirby as type ♂ to be the lectotype. The taxon is currently placed in the genus *Erythrodiplax*.

***aurea*** Fraser (***Tetrathemis***), 1924. Kimmins, 1966 : 180.

***auricolor*** Fraser (var. of ***Notiothemis jonesi***), 1944. Kimmins, 1966 : 181.

***austeni*** Kirby (***Perithemis***), 1897 : 602, pl. 12, figs. 4, 5. LECTOTYPE ♂. Manaos, 11.ii.96, ♂/Manaos, Brazil, 11.ii.96, *E. E. Austen*/austeni [WFK]/Perithemis austeni Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

***austeni*** Kirby (***Thermorthemis***), 1900 : 72–73, pl. 2, figs. 1, 1a. LECTOTYPE ♂. W. Afr[ica]/Thermorthemis austeni ♂ [WFK].

Kirby based his description upon five males, four from W. Africa (without other locality) and one male, one female from Sierra Leone. Three of the W. African males have been traced and also the male and female from Sierra Leone. This taxon is currently placed as *Orthetrum austeni* (Kirby).

***australis*** Kirby (***Brachydiplax***), 1894: 18–19. Holotype ♂. Queensland, *Turner*/australis Kb. type [WFK].

***australis*** Kirby (***Brachymesia***), 1889 : 330. Holotype ♂. 'Sydney, N.S.W.'/australis type [WFK].

Locality label believed to be incorrect and the taxon is currently placed in the synonymy of *Brachymesia furcata* Hagen, a South American species.

***azorensis*** Gardner (ssp. ***Sympetrum fonscolombei***), 1958 : 791–792. Holotype ♂. Azores, Pico 13, 17.viii.52, paired, leading, *J. D. Carthy*/Sympetrum fonscolombei azorensis Gardner, Type ♂, E. Gardner det.

The holotype ♂ and allotype ♀ were taken paired.

**azteca** Calvert (***Tauriphila***), 1906 : 297, 298. Holotype ♂ (somewhat teneral). Guadaljaro, Jalisco, July, *Schumann*/Tauriphila azteca Calv. TYPE. P. P. Calvert det. 1906. B.C.A. Neur., p. 298.

**basalis** Kirby (***Micrathyria***), 1897 : 610–612, pl. 12, fig. 1. LECTOTYPE ♂. W. end of Parana de Buyassu, 16.i.96/Parana de Buyassu, Lower Amazon, 16.i.96, *E. E. Austen*/basalis [WFK]/Micrathyria basalis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Kirby mentions two other localities after his description, Obidos (♂) and Breves (♀) and I consider these three examples to be the syntype series. Three additional males discussed later by Kirby are considered as additional non-syntype material, although one of them bears a Kirby cotype label. The taxon is currently placed in the genus *Erythrodiplax*.

**basilinea** McLachlan (***Libellula***), 1894 : 430–431. LECTOTYPE ♂. Ta-chien-lu/Type [McL. label]/Libellula basilinea McL./Libellula basilinea McL., ♂ Lectotype, D. E. Kimmins det. 1967.

**batesi** Kirby (***Cannacria***), 1889 : 341, pls. 53, fig. 1 and 57, fig. 9. Holotype ♂. Amaz[ons]/Cannacria Batesii type [WFK].

The ending of the specific name has been changed to a single 'i' in accordance with Art. 31. This taxon is currently placed in the genus *Brachymesia*.

**bella** Kirby (***Perithemis***), 1889 : 324, pl. 51, figs. 8, 9. LECTOTYPE ♂. 115/Santarem/bella Kb. ♂ [WFK]/Perithemis bella Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The example in the BM type collection, though bearing Kirby's determination label, was not chosen as lectotype since its locality label is 'Amaz.', whereas the type-locality is specified as 'Santarem'.

**bifida** Fraser (***Tetrathemis***), 1941. Kimmins, 1966 : 182.

**bimacula** Kimmins (***Misagria***), 1943 : 156–159, figs. 1–6. Holotype ♂. R. Demarara, B. Guiana/Misagria bimacula Kim., ♂ TYPE, det. D. E. Kimmins.

[**biolleyi** Calvert (***Orthemis***), 1906 : 233, 237, pl. 9, figs. 36, 37.

The example in BM(NH) is one of the syntypes but is not labelled Type by Calvert. In the circumstances, Ris (1910 : 286–287) should be considered as having selected the ♂ in the Calvert Collection (Costa Rica, Esparta) as Lectotype, and the ♂ in BM(NH) from Bugaba is therefore a paralectotype.]

**blackburni** McLachlan (***Lepthemis***), 1882 : 229–231. LECTOTYPE ♂. Hawaiian Islands/Lepthemis? Blackburni McL./Type [McL. label]/Lepthemis blackburni McLachlan, ♂ Lectotype, D. E. Kimmins det. 1967.

Now placed in the genus *Nesogonia*.

**borneense** Kimmins (***Orthetrum***), 1936*a* : 70–73, figs. 2, 3. Holotype ♂. Sarawak, Mt. Dulit, 4,000 ft., 22.x.1932. B in cop. A/Oxford Univ. Exped., *B. M. Hobby, A. W. Moore & J. Ford*/Orthetrum borneense ♂ sp. n., Holotype, det. D. E. Kimmins.

**braueri** Kirby (***Lyriothemis***), 1889 : 332. Holotype ♀. Sula, *Wallace*, D. E. Kimmins, 1967/W. Borneo [WFK]/L. Braueri type [WFK].

Kirby gives the locality as Sula [Moluccas] and this locality is repeated by Ris (1909 : 108, 111), after his study of the type. When examining this type during the preparation of this paper, it was found to be labelled 'W. Borneo' in Kirby's writing. It is very unlikely that Ris would not have remarked on the discrepancy in the locality label when he studied the type, and one can only assume that at some later date there was been a change of label. I have therefore placed a 'Sula' label above the W. Borneo label. This taxon is currently placed as a synonym of *Lyriothemis cleis* Brauer.

**brevistylum** Kirby (***Orthetrum***), 1896 : 521–522. Holotype ♂. Dobar, Goolis Mts., 4.ii. 1895, *L. L[ort-] P[hillips]*/Orthetrum(?) brevistylum n.s. [WFK].

Currently placed as a synonym of *Orthetrum taeniolatum* (Schneider).

**broadwayi** Kirby (**Dythemis**), 1894*a* : 227–228. LECTOTYPE ♂. Trinidad/broadwayi/Dythemis broadwayi Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as a synonym of *Dythemis velox* Hagen.

**burmeisteri** Kirby (**Tramea**), 1889 : 316. LECTOTYPE ♂. N.W. India/Burmeisteri Kb. type [WFK]/Tramea burmeisteri Kirby, ♂ Lectotype, det. D. E. Kimmins, 1967.

In addition to the allotype ♀, there are 5 paralectotypes in the BM(NH). The taxon is currently placed as a subspecies of *Trapezostigma basilaris* (Palisot de Beauvois).

**camarense** Kirby (**Orthetrum**), 1889 : 298. Holotype ♂. Cameroons/camarense type [WFK]/Orthetrum camarense Kirby, ♂ Holotype, D. E. Kimmins det. 1967.

**cambridgei** Kirby (**Micrathyria**), 1897 : 608–609, pl. 13, fig. 4. Holotype ♂. Breves, 13.i.96/Breves, Lower Amazon, 13.i.96, *E. E. Austen*/cambridgei [WFK].

**campioni** Ris (**Allorhizucha**), 1915*a* : 214–216; Kimmins, 1942 : 47 [selection of holotype]. Lectotype ♂. KaYima, Sierra Leone, 24.vi.1912, *Jas. J. Simpson*/Allorhizucha nova spec. C, Det. Dr. F. Ris/Allorhizucha campioni Ris, ♂ Type, det. D. E. Kimmins.

**cannacrioides** Calvert (**Dythemis**), 1906 : 272, 276, pl. 8, figs. 43, 44. Holotype ♂. San Isidro, 1,600 ft., *Champion*/Dythemis cannacrioides Calv. ♂ TYPE. P. P. Calvert det. 1906. B. C. A. Neur., p. 277. Orig. Pl. viii, figs. 43, 44.

The penis of the lectotype was removed and studied by Dr. K. Buchholz.

**carpenteri** Fraser (**Oxythemis**), 1944. Kimmins, 1966 : 186.

**carpenteri** Fraser (**Tetrathemis**), 1941. Kimmins, 1966 : 186.

**celebensis** Kirby (**Protorthemis**), 1889 : 334–335, pls. 54, fig. 7 and 57, figs. 6, 6a. Holotype ♂. Mak[assar]*/Celeb[es], *Wallace*/O. celebensis type [WFK].

**ceylonica** Kirby (**Zygonidia**), 1905 : 273–275 Holotype ♂. Ceylon. *E. E. Green*/Kandy, ii.1901 [E. E. Green's writing]/Zygonidia ceylonica Kirby, ♂, D. E. Kimmins det. 1961.

Currently placed as subspecies of *Zygonyx iris* Selys.

**chirinda** Longfield (ssp. **Atoconeura biordinata**), 1953 : 46, pl. 1, figs. 3, B, H. Holotype ♂. Chirinda For., Melsetter Dist., Dept. Agric. S. Rhodesia, 27.xii.1948, *J. A. Whellan*/Atoconeura biordinata chirinda, Type ♂ subsp. nov., det. Miss C. Longfield.

**chloe** Kirby (**Rhyothemis**), 1894 : 15–16. LECTOTYPE ♀. Queensland, *Turner*/chloe Kirb. type [WFK]/Rhyothemis chloe Kirby, ♀ Lectotype, D. E. Kimmins det. 1967.

The lectotype ♀ is the darker of the two syntypes, with (in the hind wing) the 'dark spot on the subnodal sector, halfway between the dark blotch on the nodus and the clouded tip of the wings' mentioned by Kirby. Currently placed as a subspecies of *Rhyothemis phyllis*.

**chrysobaphes** Ris (**Pseudomacromia**), 1915*a* : 221–223. LECTOTYPE ♂. Sierra Leone, Sandea, 14.vi.1912, *J. J. Simpson*/Pseudomacromia nova spec. *d*, Type ♂, Det. Dr. F. Ris/Pseudomacromia chrysobaphes Ris, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed in the genus *Zygonyx*.

**cingulata** Kirby (**Nesoxenia**), 1889 : 336, pl. 53, fig. 8. LECTOTYPE ♀. [Solomon Islands], Alu/Nesoxenia cingulata type [WFK]/Nesoxenia cingulata Kirby, ♀ Lectotype, D. E. Kimmins det. 1967.

The syntype series also contained 1 ♂ (incomplete) and 1 ♀. This taxon is currently considered a subspecies of *Nesoxenia mysis* Selys.

**cladophila** Tillyard (**Tetrathemis**), 1908 : 647–648, pl. 14, fig. 5. LECTOTYPE ♂. Cooktown, N. Q., i.08, *R. J. Tillyard*/Tetrathemis cladophila Till. ♂ TYPE. R. J. T./Tetrathemis cladophila Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

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* This label was transcribed by Kirby as Makian, but according to Bradley & Betrem, 1967, *Bull. Brit. Mus. nat. Hist.* (Ent.) **20** (7) : 292, the locality should be Makassar.

***corduliformis*** Longfield (***Tetrathemis***), 1936 : 484, figs. 6, A-D. Holotype ♂. Central Africa, Uganda, Bunyoro Distr., Nyamagita Dam, 18.ii.1934, *C. E. Longfield*/Tetrathemis corduliformis sp. n. Type ♂, det. Miss C. Longfield.

***coryndoni*** Fraser (***Lokia***), 1952. Kimmins, 1966 : 187.

***cuprina*** Kirby (***Rhyothemis***), 1889 : 320, pl. 51, fig. 6. Holotype ♀. S. Leone/cuprina Kb. type [WFK].

Currently placed as a synonym of *Rhyothemis fenestrina* (Rambur).

***dalei*** Tillyard (***Nannodythemis***), 1908*a* : 449–450, pl. 6, fig. 2. LECTOTYPE ♂. Blue Mts., N.S.W., ii.1908, *R. J. Tillyard*/Nannodythemis Dalei Till. ♂ TYPE, R. J. T./Nannodythemis dalei Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed in the genus *Nannophya*.

***darwini*** Kirby (***Tramea***), 1889 : 315, pl. 51, fig. 1. LECTOTYPE ♀. Galapagos/Galapagos/28/Darwinii Kb. type [WFK].

The remaining four female syntypes (in bad condition) are still in the B.M. collection. This taxon is currently placed as a synonym of *Trapezostigma cophysa* (Selys).

***davina*** Fraser (ssp. ***Zygonyx iris***), 1926. Kimmins, 1966 : 188.

***denticauda*** Fraser (***Tetrathemis***), 1954. Kimmins, 1966 : 189.

***diamangae*** Longfield (***Aethiothemis***), 1959 : 35, 36, fig. 5A. Holotype ♂ (teneral), N. Angola. Lunda Prov., Dundo, iii.1949/Aethiothemis diamangae, Type ♂, det. Miss C. Longfield.

***dispar*** Selys (***Trithemis***, ?aberration), 1883 : 107. Holotype ♀. Japan/Type [McL. label]/Trithemis phaon, var. ♀ dispar Selys.

Currently placed as a synonym of *Deielia phaon* (Selys).

***disparilis*** Kirby (***Neurothemis***), 1889 : 322–323, pl. 54, fig. 8. LECTOTYPE ♂ (head missing). W. Borneo/N. disparilis ♂ [WFK]/Neurothemis disparilis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

***dissocians*** Calvert (***Micrathyria***), 1906 : 222, 226, pl. 9, figs. 19–21. LECTOTYPE ♂. Atoyac, Vera Cruz, May, *H.H.S[mith]*/Micrathyria dissocians Calv. ♂ TYPE. P. P. Calvert det. 1906. B.C.A. Neur., p. 226, Orig. of pl. ix, figs. 19–21/Micrathyria dissocians Calvert, ♂ Lectotype, D. E. Kimmins det. 1967.

Ris (1911 : 440) refers to the Portorico specimen as 'Calvert's Type'. I do not consider this to be a designation of Lectotype, and consider that the data on the above mentioned example makes it clear that Calvert considered it to be the type, especially as the second Vera Cruz example is not marked TYPE.

***distanti*** Kirby (***Stoechia***), 1898 : 236–237. LECTOTYPE ♂. Pretoria (*W. L. D[istant]*)/distanti Kirby type [Distant's writing]/Stoechia distanti Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as synonym of *Trithemis dorsalis* (Rambur).

***donaldi*** Lieftinck (***Lanthanusa***), 1955 : 161–164, figs. 5–9. Holotype ♂. N.E. New Guinea, Saiko, 5,500–6,000 ft., Babu River (Upper Waria River), ix–x.1936, *D. Shaw-Meyer*/Lanthanusa donaldi Lieft. Det. M. A. Lieftinck, 1955. Holotype.

***dorothea*** Fraser (ssp. ***Agrionoptera insignis***), 1927. Kimmins, 1966 : 189.

***dubia*** Fraser (***Porpacithemis***), 1954. Kimmins, 1966 : 190.

***ducalis*** Kirby (***Rhyothemis***), 1898 : 230–232. LECTOTYPE ♂. Fort Johnston, Nyassaland, *P. Rendall*/Rhyothemis ducalis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Two ♂, one ♀ of the four syntypes are from Fort Johnston; the ♀ from Pretoria, though marked 'cotype' by Kirby, was in effect excluded from the syntypes by Kirby's statement (231) 'The specimens from Fort Johnston are to be considered typical.' Currently placed as a synonym of *R. semihyalina* Desjardins.

***eltoni*** Fraser (***Phyllothemis***), 1935. Kimmins, 1966 : 191.

***eludens*** Tillyard (***Nannophlebia***), 1908 : 645–647, pl. 14, fig. 4. LECTOTYPE ♂. Cairns, N. Q., v.05, *E. Allen*/Nannophlebia eludens Till. ♂ TYPE, R.J.T./Nannophlebia eludens Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

***equestris*** Fabricius (***Libellula***), 1781 : 523. Campion, 1917 : 445.

***equivocata*** Kirby (***Thermochoria***), 1889 : 339, pl. 52, fig. 8. Holotype ♂. W. Afr[ica]/Thermochoria equivocata type [WFK].

***erichsoni*** Kirby (***Trithemis***), 1894 : 263. LECTOTYPE ♂. Amaz./erichsoni [WFK]/Trithemis erichsoni Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

This specimen was the basis of the drawings and notes sent by the present author to D. J. Borror in Jan. 1935, and referred to in his monograph on *Erythrodiplax*. This taxon is currently placed in synonymy of *Erythrodiplax unimaculata* (De Geer).

***eudoxia*** Kirby (***Accaphila***), 1909 : 60. Holotype ♂. Ruwenzori East, alt. 6,000 ft., 30.i.07/Ruwenzori Exp./Accaphila eudoxia Kb. type.

Currently placed in the genus *Atoconeura*.

***eurybia*** Selys (***Libellula***), 1878 : 293, 298. Holotype ♂. Menado/Type [McL. label]/Lib. eurybia Selys ♂, race de Chinensis? [Selys writing].

Currently placed in the genus *Trapezostigma*.

***exigua*** Kirby (***Fylla***), 1889 : 345, pl. 52, fig. 6. LECTOTYPE ♂. Gil[olo]/*Wallace*/Fylla exigua Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The syntype series was found in the museum collection, without type-indication or determination labels by Kirby. One can only presume that as Kirby reduced the taxon to synonymy of *Nannophya pygmaea* Rambur in his Catalogue of Odonata published the following year, he removed his determination labels. The series now contains paralectotypes from Borneo, Gilolo and Morty.

***eximia*** Kirby (***Micrathyria***), 1897 : 609, pl. 13, fig. 3. LECTOTYPE ♂. Obydos, 2.ii.96/Obydos, Lower Amazon, 2.ii.96, *E. E. Austen*/eximia [WFK]/Micrathyria eximia Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The lectotype is the specimen which, for many years, has carried a red BM type label. The remaining 3 ♂ syntypes have been labelled paralectotypes. Since Kirby stated that the species was described from four males from Obydos, the male mentioned by him from Para is excluded from the syntype series.

***extraordinata*** Fraser (***Atoconeura***), 1950. Kimmins, 1966 : 191.

***falsum*** Longfield (ssp. ***Orthetrum capense***), 1955 : 26. Holotype ♂. B. E. Africa, Kenya, Thoura Forest, Meru, 600 ft., 30.i.1934, far from water, *C. E. Longfield*/Orthetrum capense falsum Longf., Type ♂, det. Miss C. Longfield.

Currently placed as subspecies of *Orthetrum capicola* Kimmins.

***fasciata*** Kirby (***Celithemis***), 1889 : 326, pl. 52, fig. 2. LECTOTYPE ♂. Georgia/fasciata Kb. type [WFK]/Celithemis fasciata Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

***fasciata*** Kirby (***Deielia***), 1892 : 330, pl. 53, fig. 6. McLachlan, 1892 : 177–178. Holotype ♀. 137/Sandw[ich] Is., *Beechey*/Loo Choo Is , Voy. of 'Blossom', See McLachlan, *An. Mag. Nat. Hist.* (6) x. p. 177 (1892)/Deielia fasciata, type [WFK].

As explained by McLachlan (1892), the original locality label on this specimen appears to have been incorrect, as the insect has not been refound in the Hawaiian Islands. It does occur in the Loo Choo (Ryukyu) Islands, which were also visited by the 'Blossom', and it is considered most likely that the example came from these islands. The taxon is currently considered a synonym of *Deielia phaon* (Selys).

***ferruginata*** Fabricius (***Libellula***), 1781 : 521. Campion, 1917 : 445.

***fitzgeraldi*** Pinhey in Longfield (***Nesciothemis***), 1955 : 61–63, figs. 10 B, D, F; Pinhey, 1955 : 30–32, fig. 6. Holotype ♂. Lake Chila, Abercorn, N. R., 31.i.54, *D. Vesey-Fitzgerald*/Orthetrum(?) fitzgeraldi Pinh. 1954, Holotype/Nesciothemis fitzgeraldi (Pinhey), det. Miss C. Longfield.

The type of *Orthetrum*(?) *fitzgeraldi* Pinhey was presented to the BM(NH) when the manuscript was sent to press. Publication was unavoidably delayed, and in the belief that Pinhey's paper was due to appear, Miss Longfield included a description of *fitzgeraldi* in her paper on African *Orthetrum*, placing it in her new genus *Nesciothemis*, the publication of which unfortunately antedated Pinhey's paper.

***flava*** Longfield (***Monardithemis***), 1947 : 23–25, figs. 9–10. Holotype ♂ (original designation as type). Kalukembé, Dec./Angola, Miss. sc. suisse, 1932–1933/Monardithemis flava genotype ♂, det. Miss C. Longfield.

***flavescens*** Kirby (***Miathyria***), 1897 : 600–601, pl. 13, fig. 2. LECTOTYPE ♂. Santarem/113 ♂/ Miathyria flavescens Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The lectotype ♂, which has for many years carried a red BM type-label, has no determination label by Kirby, but the locality label agrees with the type-data and there is no doubt that it is one of the syntypes. On the other hand, an example bearing Kirby's label 'Miathyria flavescens K. cotype' is from Para, not Santarem and is from the Saunders collection (not Bates) and cannot therefore be a syntype.

***flavescens*** Kirby (***Tetrathemis***), 1889 : 343, pl. 52, fig. 4. LECTOTYPE ♂. Sar[awak]/*Wallace*/T. flavescens type [WFK]/Tetrathemis flavescens Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

***flavidulum*** Kirby (***Orthetrum***), 1898 : 238. LECTOTYPE ♀. Pretoria, *W. L. D.*[*istant*]/ Orthetrum flavidulum Kirby, ♀ Lectotype, D. E. Kimmins det. 1967.

Of the four examples (listed by Kirby as females), the example from the Pienaars River, iii.1894 proves to be a ♂. Currently placed as synonym of *Orthetrum abbotti* Calvert.

***flavifrons*** Kirby (***Chalcostephia***), 1889 : 337. Holotype ♂. Angola/Chalcostephia flavifrons type.

***flavopicta*** Kirby (***Orthemis***), 1889 : 332–333, pls. 54, fig. 1 and 57, fig. 5. LECTOTYPE ♂. Para/43/Orthemis flavopicta type/Orthemis flavopicta Kirby, Holotypus präp. Dr. Buchholz/ Orthemis flavopicta Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

From the syntype series of 4 ♂, 1 ♀, the ♂ bearing Kirby's type label has been chosen as lectotype.

***foliata*** Kirby (***Belonia***), 1889 : 333, pl. 54, fig. 4. Holotype ♀ (by original designation). [Mexico], Dueñas/foliata Kb. type [WFK].

Currently placed in the genus *Libellula*. The ♂ from Guatemala, doubtfully referred to *Belonia foliata* by Kirby, is now considered to be a synonym of *Libellula herculea* Karsch.

***fraseri*** Pinhey (***Olpogastra***), 1955 : 39–40, pl. 3, fig. 1, text-fig. 8. Holotype ♂. Aswa R., Acholi, Uganda, March 1952, *T. H. E. Jackson*. Olpogastra fraseri Pinh. 1954, Holotype.

Currently placed in the genus *Zygonoides* Pinhey.

***frontalis*** Kirby (***Lyriothemis***), 1889 : 332. Holotype ♀. Sul[a]/Sula, *Wallace*/L. frontalis type [WFK].

Currently placed as a synonym of *Lyriothemis cleis* Brauer.

***fulgens*** Kirby (***Rhyothemis***), 1889 : 322. Holotype ♂. Sar[awak]/fulgens, Kb. type [WFK].

***gamblesi*** Longfield (***Oxythemis***), 1959 : 36–38, figs. 5 B, C. Holotype ♂. S. Nigeria, Ikorodu, Ogun Delta, 26.ii.1956, *R. M. Gambles*/Oxythemis gamblesi Type ♂, det. Miss C. Longfield.

***gardneri*** Fraser (***Hylaeothemis***), 1927. Kimmins, 1966 : 194.

***grenadensis*** Kirby (***Brechmorhoga***), 1894*b* : 265. LECTOTYPE ♂. Grenada/106/grenadensis [WFK]/Brechmorhoga grenadensis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as a subspecies of *Brechmorhoga praecox* (Hagen).

[***hageni*** Kirby (***Micrathyria***), 1890 : 41]

This name was proposed for *Dythemis didyma* Hagen, 1861, nec Selys, 1857 and the type should therefore be selected from Hagen's material.

***hyalinum*** Kirby (***Orthetrum***), 1886 : 326–327, pl. 33, figs. 5, 6. LECTOTYPE ♂. N.W. Ind[ia]/Campbellpore, 14.xi.85, 7/hyalinum Kirb. ♂ type [WFK]/Orthetrum hyalinum Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as a synonym of *Orthetrum taeniolatum* (Schneider).

***hyalina*** Kirby (***Tetrathemis***), 1889 : 342, pl. 56, fig. 8. Holotype ♂ (lacking abdominal segments 5–10). Borneo/T. hyalina type [WFK].

Currently placed as subspecies of *Tetrathemis irregularis* Brauer.

[***icteroptera*** Selys (***Libellula***), 1857, in Sagra, *Hist. Cuba*, **7** : 190.]

This species was briefly differentiated as a race in a note on *Libellula metella* Selys; the type locality being given as Buenos Ayres. The McLachlan collection included an example determined by Selys as *Lib. icteroptera* Selys ♀, to which McLachlan had added a type label. This cannot however be the type, as its locality label is Minas Geraes.

***immaculata*** Fraser (***Zygonyx***), 1933. Kimmins, 1966 : 196.

***imperatrix*** Selys (***Rhyothemis***), 1887 : 53–54. Holotype ♂. Ryukyu [Loo Choo], vi–viii.1887 [*Pryer*]/Rhyothemis imperatrix Selys, nov. sp.? ou *race* de splendida, R. ♂, Loo Choo [Selys' writing].

Selys saw originally only this one example, but McLachlan subsequently received three females with the same locality data (collected by Pryer), of which one was given to Selys and was described by him (1888 : 1); the other two females are now in BM(NH).

***indica*** Fabricius (***Libellula***), 1781 : 521. Campion, 1917 : 444.

***indica*** Fraser (***Hylaeothemis***), 1946. Kimmins, 1966 : 196.

***indica*** Kirby (***Brachydiplax***), 1889 : 329, pl. 54, fig. 9. LECTOTYPE ♂. N. Ind[ia]/B. indica ♂ type [WFK]/Brachydiplax indica Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The mature ♂ has been chosen as lectotype, as this example has been segregated in the type-collection since 1940.

***infuscatum*** Selys (***Diplax***), 1883 : 90. LECTOTYPE ♂. Japan/Type/Diplax infuscata Selys, ♂ Japon/Diplax infuscata Selys, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed in the genus *Sympetrum*.

***insignis*** Kirby (***Zygonidia***), 1900*a* : 533–534, pl. 12, fig. 1. LECTOTYPE ♂. 5-fingered Mt., Hainan, *J. T. Thomasson*/Zygonidia insignis, *type* [WFK]/Zygonidia insignis Kirby, ♂ Lectotype, D. E. Kimmins det., 1967.

Currently placed as a synonym of *Zygonyx iris* Selys.

***insularis*** Kirby (***Agrionoptera***), 1889 : 336–337. LECTOTYPE ♂. [Solomon Is.] Santa Anna/Agrionoptera insularis ♂ type [WFK]/Agrionoptera insularis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as a subspecies of *Agrionoptera insignis* (Rambur).

***insularis*** Kirby (***Cannaphila***), 1889 : 341. Lectotype ♀ (Ris, 1910 : 295). Hayti/Cannaphila insularis Kirby, ♀ Lectotype, F. Ris design. 1910 [D.E.K. hand].

I consider that Ris' action (1910 : 295) in citing 'British Museum: 1 ♀ juv. Hayti (Kirby's Type)' is equivalent to selection of a lectotype. There is one other ♀ in BMNH, which bore Kirby's determination *Cannaphila insularis*, but this has a locality label St. Dom. [Santo Domingo], which is in Haiti and was probably a syntype. This is now labelled paralectotype. I have been unable to trace the ♂ syntype referred to by Kirby.

Kirby's statement '*Hab.* Haiti (types in British Museum); Jamaica (Dublin Museum)' eliminated the Dublin Museum example(s) from consideration as lectotype.

***intensa*** Kirby (***Perithemis***), 1889 : 326, pl. 51, fig. 7. Holotype ♂ (abd. segs. 9–10 missing). Mex[ico]/intensa Kb. type [WFK].

***intermedia*** Fraser (***Protorthemis***), 1936. Kimmins, 1966 : 198.

***internum*** McLachlan (var. of ***Orthetrum japonicum***), 1894 : 431–432. LECTOTYPE ♂. Ta-chien-lu/O. japonicum var. internum McL./Orthetrum japonicum internum McL., ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as *Orthetrum japonicum internum* McL.

***iridescens*** Kirby (***Urothemis***), 1898 : 235. LECTOTYPE ♂ (abd. segs. 6–10 missing). Fort Johnston, Nyassaland, *P. Rendall*/iridescens Kirby type [WFK]/Urothemis iridescens Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as synonym of *Urothemis edwardsi* (Selys).

***isa*** Fraser (ssp. of ***Zygonyx iris***), 1926. Kimmins, 1966 : 198.

***isis*** Fraser (***Zygonyx***), 1924. Kimmins, 1966 : 198.

***iulia*** Kirby (***Orthetrum***), 1900 : 75–77, pl. 2, fig. 3. LECTOTYPE ♂ (abd. segs. 9–10 missing). Sierra Leone/Orthetrum julia type [WFK].

Kirby writes (: 77) 'The species is described from four specimens from Sierra Leone, two of which were collected by Mr. Austen on Aug. 26 and Sept. 11 (1899).' The example designated as Lectotype is the only one bearing Kirby's determination label. The allotype female has for many years borne a museum type label but now has no locality label (?Sierra Leone, 42.31). Of the listed examples collected by Austen, one (without abdomen), labelled 'Free Town, Sierra Leone, 26.viii.1899, E. E. Austen' has been located but the other is missing.

***kalai*** Longfield (ssp. ***Orthetrum stemmale***), 1936 : 487, 488, fig. 7. Holotype ♂. S. Rhodesia, Victoria Falls, Zambesi River, Kalai Island, 7.iv.1936, *C. E. Longfield*/Orthetrum stemmale kalai sp. nov. Type ♂, det. Miss C. Longfield.

***kalula*** Kirby (***Trithemis***), 1900 : 69, pl. 2, figs. 2, 2a. LECTOTYPE ♂. Free Town, Sierra Leone, 13.ix.99, *E. E. Austen*/Trithemis kalula Kb. type [WFK].

Kirby lists four males, but only three can now be traced in the collections; of these, only the lectotype bears Kirby's determination label. This specimen has for many years carried a red type label and has been considered to be the type. The two remaining males are considered paralectotypes.

***kenya*** Longfield (spp. ***Atoconeura biordinata***), 1953 : 46, pl. 1, figs. 5, 9, C, G. Holotype ♂. B.E. Africa, Kenya, Meru, 6,000 ft., on swift stream, 29.i.1934, *C. E. Longfield.* Atoconeura biordinata kenya, Type ♂ subsp. n., det. Miss C. Longfield.

***kerri*** Fraser (***Amphithemis***), 1933. Kimmins, 1966 : 198.

***lacustris*** Kirby (***Trithemis***?), 1889 : 329. Holotype ♂. [Central Africa] Wadelai, 27.i.1887 [*Emin Pasha*]/lacustris Kb. type [WFK].

Currently placed in the genus *Brachythemis*.

***lankana*** Kirby (***Rhyothemis***), 1893 : 549–550. Holotype ♂. Udagama, 26.iv.92/Ceylon, *Yerbury*, (on reverse) lankana type/Rhyothemis lankana Kirby, ♂ Holotype, D. E. Kimmins det. 1967.

***leakeyi*** Pinhey (***Lokithemis***), 1955 : 34–35, pl. 3, figs. 3, 4, 6, and text-fig. 7. Holotype ♂. Lake Chila, Abercorn, N. Rhodesia, 31.i.54, *D. Vesey Fitzgerald*/Lokithemis leakeyi Pinh. Holotype.

[***levis*** Calvert (***Orthemis***), 1906 : 233, 238, pl. 9, figs. 38, 39.]

No example in our B.C.A. series was marked TYPE by Calvert and our specimens are therefore considered as syntypes. The true type is probably in some other collection.

***lewisi*** Selys (***Lyriothemis***), 1883 : 96–97. LECTOTYPE ♂. Japan, *Lewis*/Lyriothemis lewisii Selys ♂, Japon/Lyriothemis lewisi Selys, ♂ Lectotype, D. E. Kimmins det. 1967.

Ris (1909 : 119) in the list of material dealt with cites '1 ♂ Japon (Pryer, Selys Type der *L. lewisi*)'; this cannot be accepted as a designation of lectotype, since Selys limits his material to 'Japon, par M. G. Lewis, communiquée par MacLachlan (coll. MacLachlan, Selys)'. I have therefore designated the above specimen as Lectotype. Currently placed as a synonym of *L. pachygastra* (Selys).

***lieftincki*** Fraser (***Rhodothemis***), 1954. Kimmins, 1966 : 201.

***lifuana*** Kimmins (ssp. ***Agrionoptera insignis***), 1953 : 243–244, figs. 1–3. Holotype ♂. Lifu/Agrionoptera insignis lifuana Kim. ♂ Holotype, D. E. Kimmins det. 1951.
Currently placed as a subspecies of *Agrionoptera papuensis*.

***longipennis*** Kirby (***Belonia***), 1889 : 334. Holotype ♀. Cuença/longipennis Kb. type [WFK].
Currently placed as a synonym of *Libellula herculea* Karsch.

***lorti*** Kirby (***Orthetrum***), 1896 : 522–523. Holotype ♀ (lacking abd. segs. 6–10). Dobar, Goolis Mts., 4.ii.1896, L. L[ort-] P[hillips]/Orthetrum lorti.
Currently placed as synonym of *Crocothemis erythraea* (Brullé).

***machadoi*** Longfield (***Orthetrum***), 1955 : 35–39, figs. 5, A, E, J. Holotype ♂. N.E. Angola, Dundo, Lunda Distr., 13.xii.1947/Orthetrum machadoi Type ♂, in cop. with type ♀, det. Miss C. Longfield.

***macrostigma*** Longfield (***Orthetrum***), 1947 : 25–27, fig. 11. Holotype ♂. Lunda, sept./ Angola Miss. sc. suisse, 1932–1933/Orthetrum macrostigma Type ♂, det. Miss C. Longfield.

***madagascariensis*** Kirby (***Tramea***), 1889 : 317. Holotype ♂. Betsileo, Madag. [WFK]/ madagascariensis Kb. type [WFK].

This taxon is currently placed as a synonym of *Trapezostigma limbata* (Desj.).

***malabarica*** Fraser (ssp. ***Zygonyx iris***), 1926. Kimmins, 1966 : 203.

***malcolmi*** Fraser (***Brachydiplax***), 1922. Kimmins, 1966 : 203.

***marginata*** Fabricius (***Libellula***), 1781 : 523. Campion, 1917 : 445.

***marshalli*** Kirby (***Misthotus***), 1905*a* : 192–193. LECTOTYPE ♂. Salisbury, Mashonaland, Marshall/5. Salisbury, Nov. 1903, in copula. *G. A. K. M[arshall]*/marshalli Kb. type [WFK]/Misthotus marshalli Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.
The 'still more immature male' referred to by Kirby cannot be traced. Currently placed as a synonym of *Trithemis dorsalis* (Rambur).

***maya*** Calvert (***Dythemis***), 1906 : 272, 275, pl. 8, fig. 45. Holotype ♂. San Geronimo, Vera Paz, *Champion*/Dythemis maya Calv. TYPE ♂. P. P. Calvert det. 1906. B. C. A. Neur., p. 275. Original of Pl. viii, fig. 45.
The penis of the lectotype was removed and studied by Dr. Buchholz.

***metallica*** Fraser (ssp. of ***Zygonyx iris***), 1931. Kimmins, 1966 : 203.

***mildredae*** Fraser (ssp. of ***Zygonyx iris***), 1920. Kimmins, 1966 : 204.

***monteiroi*** Kirby (***Thermorthemis***), 1900 : 73. Holotype ♀. Angola/monteiroi Kb. type [WFK].
Currently considered a synonym of *Orthetrum austeni* (Kirby).

***multipunctata*** Kirby (***Dythemis***), 1894*b* : 265–266. LECTOTYPE ♂ (left fore wing missing). St. Vincent/Pools near Bannonallie, Jan. 12/multipunctata [WFK]/Dythemis multipunctata Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.
I have chosen as lectotype the ♂ which has for many years carried a BM red type label and of which the penis was removed and studied by Dr. K. Buchholz.

***multipunctata*** Kirby var. (***Dythemis***), 1894*b* : 266. LECTOTYPE ♂. Grenada/235/ Dythemis multipunctata var. Kirby, ♂ Lectotype, D. E. Kimmins det. 1967/Dythemis sterilis Hag., det. D. E. Kimmins.
Currently placed as a synonym of *Dythemis sterilis* Hagen.

***nicevillei*** Kirby (***Orthetrum***), 1894*c* : 112–113. LECTOTYPE ♂. Burma/nicevillei Kb. type ♂ [WFK]/Orthetrum nicevillei Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.
One of Kirby's determination labels had at some time been transferred from a ♂ syntype to a ♀ which was not received at the BM(NH) until after publication of the description. This label has been replaced on its correct specimen. Currently placed as synonym of *Orthetrum glaucum* Brauer.

***nigra*** Longfield (ssp. of ***Trithemis donaldsoni***), 1936 : 491–493, 496, figs. 9, 10. Holotype ♂ (last 5 abdominal segments missing). W. Africa, Principe I., Ogui Pipi, 7.xii.1932, *W. H. T. Tams*/Trithemis donaldsoni nigra ssp. nov. Type ♂, det. Miss C. Longfield.

In the original description, only the above example was mentioned, but in a list (: 496), two ♂ are recorded. The second one (a complete example) had been labelled by Miss Longfield as type and the holotype labelled as paratype. This error has now been corrected and the second example cannot be considered even as a paratype, as it is not mentioned in the original description.

***nigricolor*** Fraser (***Amphithemis***), 1922. Kimmins, 1966 : 206.

***nigrifrons*** Kirby (***Orthetrum***), 1894 : 19–20. LECTOTYPE ♂. Queensland, *Turner*/ Orthetrum nigrifrons Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The lectotype and paralectotype lack any determination label by Kirby. Currently placed in the genus *Crocothemis*.

***nigrilabris*** Selys (***Lib***[***ellula***]), 1872 : 177; (*Urothemis*), Selys, 1878 : 304–305. Holotype ♀. Menado/Lib. nigrilabris Selys, ♀ Type/Macrodiplax lycoris Selys.

This taxon was first described briefly (1872) in comparison with *Libellula lycoris* Selys, and a full description, with location of type given, in 1878. Currently placed as synonym of *Macrodiplax cora* Brauer.

***notablis*** Kirby (***Onychothemis***), 1906 : 277–278. Holotype ♂. Tonkin [*Fruhstorfer*]/ Onychothemis notabilis Kirby, Holotype ♂, det. D. E. Kimmins, 1967.

No Kirby determination label. Currently placed as synonym of *Onychothemis tonkinensis* Martin, 1904.

***notata*** Fabricius (***Libellula***), 1787 : 337. Campion, 1917 : 444.

***novaezealandiae*** McLachlan (var. of ***Sympetrum bipunctatum***), 1894*a* : 271–272. LECTOTYPE ♀. 29e[Hudson's locality number]/Paikakariki, Wellington, N.Z., *Hudson*/ Sympetrum bipunctatum Br., var. novae-zealandiae McL. Type/Sympetrum bipunctatum var. novaezealandiae McL., ♀ Lectotype, D. E. Kimmins det. 1967.

The fourth syntype (from Auckland) has not been traced. The name *novaezealandiae* was originally hyphenated and has been emended in accordance with Art. 32(e)(i). Currently placed as a synonym of *Diplacodes bipunctata* (Brauer).

***obsolescens*** Kirby (***Rhyothemis***), 1889 : 321. Holotype ♂. Borneo/obsolescens type [WFK].

***occidentalis*** Tillyard (***Nannodythemis***), 1908*a* : 450–453, pl. 6, fig. 3. LECTOTYPE ♂. Bridgetown, W. A[ustralia], i.07, *R. J. Tillyard*/Nannodythemis occidentalis Till., ♂ TYPE. R.J.T./Nannodythemis occidentalis Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed in the genus *Nannophya*.

***octomaculata*** Fraser (***Palpopleura***), 1935. Kimmins, 1966 : 207.

***oculata*** Fabricius (***Libellula***), 1775 : 421. Campion, 1917 : 444.

***osiris*** Fraser (ssp. ***Zygonyx iris***), 1936. Kimmins, 1966 : 208.

***othello*** Tillyard (***Camacinia***), 1908 : 639–641, pl. 14, fig. 1. Holotype ♂. Cooktown, N.Q., xii.07, *R. J. Tillyard*/Camacinia Othello Till. ♂ TYPE, R. J. T.

***pacificus*** Kirby (***Diplax***), 1884 : 355. Holotype ♂. Tongatabu, with on reverse, Diplax pacificus type [WFK].

Currently placed as synonym of *Diplacodes bipunctatus* (Brauer).

***pallidinervis*** Kirby (***Sympetrum***), 1889 : 327, pl. 55, fig. 4. LECTOTYPE ♂. Ind[ia]/ Pseudothemis pallidinervis Kb. type [WFK]/Sympetrum pallidinervis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as *Trithemis pallidinervis* (Kirby). Although described as a *Sympetrum*, Kirby labelled his specimens as *Pseudothemis*.

***parana*** Kirby **(*Misagria*)**, 1889 : 339, pls. 52, fig. 9 and 57, fig. 8. Holotype ♂. Para/Misagria parana type (WFK].

***parasticta*** Pinhey **(*Trithemis*)**, 1955 : 35–37, fig. 8. Holotype ♂. Lake Chila, Abercorn, N. R., 31.i.54, *D. Vesey Fitzgerald*/Trithemis parasticta Pinh., 1954.

***phaon*** Selys **(*Trithemis*)**, 1883 : 106–107. LECTOTYPE ♂. Yokohama, Orio/Type [McL. label]/Trithemis phaon Selys ♂, Japon [Selys label]/Trithemis phaon Selys, ♂ Lectotype, D. E. Kimmins det. 1967.

Selys gives no indication as to the collection in which the type was deposited. Ris (1911 : 589) makes no mention of the type in the Selys Collection and therefore the above specimen from the McLachlan Collection has been designated as Lectotype. Currently placed in the genus *Deielia* Kirby.

***phillipsi*** Kirby **(*Orthetrum*)**, 1896 : 522. Holotype ♂. Dobar, 2nd Feby. 95, maritime plain/Dobar, Goolis Mts , 2.ii.1895, *L. L[ort-] P[hillips]*/Orthetrum Phillipsi Kb. type [WFK].

It may be pointed out that the locality data given on the second (printed) label and in the description differs from that given on the first (mss) label. The date on the printed label has been altered to conform with the mss label. Currently placed as a synonym of *Orthetrum abbotti* (Calvert).

***prateri*** Fraser **(*Pseudotramea*)**, 1920. Kimmins, 1966 : 210.

***princeps*** Kirby **(*Rhyothemis*)**, 1894 : 16–17. LECTOTYPE ♂. Queensland, *Turner*, princeps Kb. ♂ type/Rhyothemis princeps Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

***pruinosa*** Kirby **(*Micrathyria*?)**, 1894*b* : 267–268. Holotype ♂ (abd. segments 8–10 missing). Grenada/233/pruinosa [WFK]/Micrathyria (?) pruinosa Kirby, ♂ Holotype, D. E. Kimmins det. 1967.

Currently placed as synonym of *Micrathyria didyma didyma* (Selys).

***pseudeudoxia*** Longfield (ssp. ***Atoconeura biordinata***), 1953 : 46, pl. 1, figs. 2, E, H. Holotype ♂. Uganda, Ruwenzori Range, Mubuku Valley, Bikoni Peak, 7,000 ft., 30.xii.1937, *C. E. Longfield*/Atoconeura biordinata pseudeudoxia Type ♂, ssp. nov. det. Miss C. Longfield.

***pseudodefecta*** Pinhey (ssp. ***Hadrothemis defecta***), 1961 : 127–128, pl. 9, fig. 2. Holotype ♂. Entebbe, Uganda, Oct. 1952, *E. Pinhey*/Hadrothemis defecta pseudodefecta Pinh. Holotype.

***puella*** Kirby **(*Aino*)**, 1890 : 113. LECTOTYPE ♂ (lacking abd. segs. 9–10). N. pygmaea/ Aino puella Kirby, ♂ Lectotype. D. E. Kimmins det. 1967.

The only example labelled 'puella' and with type label was the female, but the ♂ syntype was discovered labelled solely 'N. pygmaea'. It agrees well with the original description and has been designated the lectotype. The locality of the syntypes was unknown. The taxon is currently placed as a synonym of *Nannothemis bella* Uhler, a South American insect.

***pusilla*** Kirby **(*Miathyria*)**, 1889 : 318, pl. 52, fig. 3. LECTOTYPE ♂. Amaz[ons]/142/ Miathyria pusilla type [WFK]/Miathyria pusilla Kirby, ♂ Lectotype, det. D. E. Kimmins, 1967.

Kirby gives as localities for this species, Tapajos and Santarem; there are three paralectotypes from these localities, one of which is labelled 142 ♀. In spite of the fact that the specimen bearing Kirby's type label has only 'Amaz[ons]' as locality, I have accepted it as lectotype. This taxon is currently placed as a synonym of *Miathyria simplex* (Rambur).

***reducta*** Fraser **(*Uracis*)**, 1946. Kimmins, 1966 : 211.

***regalis*** Tillyard **(*Agrionoptera*)**, 1908 : 643–645, pl. 14, fig. 3. LECTOTYPE ♂. Cooktown, N.Q., i.08, *R. J. Tillyard*/Agrionoptera regalis Till., ♂ TYPE, R.J.T./Agrionoptera regalis Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as synonym of *Agrionoptera longitudinalis* Selys.

***rendalli*** Kirby **(*Urothemis*)**, 1898 : 234. Holotype ♀. Fort Johnston, Nyassaland, *P. Rendall*/rendalli Kirb. paratype [Distant's writing]/Urothemis rendalli Kirby ♀ TYPE, D. E. Kimmins det. 1956.

As *U. rendalli* was described from one female, Distant's label 'paratype' must be an error. Currently placed as synonym of *Urothemis edwardsi* (Selys).

[***resplendens*** Selys (***Rhyothemis***), 1878 : 300–301.]

The unnamed variety mentioned by Selys (: 301) is in the BM(NH). Although given a type label by McLachlan, it is not considered to be a type.

***reticulata*** Kirby (***Crocothemis***), 1886 : 328, pl. 33, figs. 8, 9. Holotype ♂. Campbellpore, 21.xi.85/N.W. Ind[ia]/reticulata Kirb. type.

Currently placed as synonym of *Crocothemis servilia* (Drury).

***rezia*** Kirby (***Aethriamanta***), 1889*a* : 298. Holotype ♂ (lacking abd. segs. 5–10). Madag[ascar]/rezia Kb. type.

***risi*** Campion (***Oda***), 1915 : 489–491, fig. 40. Holotype ♂. Utakwa R., Dutch N. Guin., 2,500–3,000 ft., ii.1913, *A. F. R. Wollaston*/Oda nov. spec. Det. Dr. F. Ris/Oda risi Cmpn. Holotype, Determined by H. Campion.

Currently placed in the genus *Risiophlebia*.

***risi*** Longfield (***Trithemis***), 1936 : 490, 491, fig. 8A. Holotype ♂. Brit. E. Africa, 31.iii.11, *S. A. Neave*/Trithemis distanti ♂, Dr. F. Ris det./Trithemis risi Longfield, ♂ Holotype, D. E Kimmins det. 1967.

Longfield (: 491) states 'Lectotype ♂ and ♀ have been selected from specimens collected by *Dr. Neave* in British E. Africa in 1911.' As she was describing a new species, in effect she designated holotype ♂ and allotype ♀. Pinhey (1962, *Publ ções cult. Co. Diam. Angola* **59** : 271) quotes the Transvaal ♂ of *ambiguus* Kirby as lectotype of *risi* Longfield, but although Longfield quotes this specimen in synonymy, she designated a holotype for *risi* Longfield.

***risi*** Pinhey (ssp. ***Porpax asperipes***), 1958*a* : 115–116. Holotype ♂. Chibudzana R., Melsetter Dist., 26.ii.1948, Dept. Agric. S. Rhodesia/Porpax asperipes ssp. risi Pinhey, 1956, Type.

Subsequently raised to specific rank.

***risi*** Tillyard (***Nannophlebia***), 1913*a* : 713–714, pl. 74, figs. 4, 5, 7. LECTOTYPE ♂. Bellinger R., N.S.W., 30.xi.11, *R. J. Tillyard*/Nannophlebia risi Till., ♂ TYPE, R. J. T./Nannophlebia risi Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

***robertsi*** Fraser (***Notiothemis***), 1944. Kimmins, 1966 : 211.

***rubra*** Kirby (***Trithemis***), 1889 : 328. LECTOTYPE ♂. Australia/T. rubra type [WFK]/ Trithemis rubra Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

As Australia is the first locality mentioned, and Kirby's type label was attached to the Australian specimen, this has been chosen as the Lectotype. Currently placed as a synonym of *Diplacodes haematodes* Burmeister.

***ruwenzoriensis*** Fraser (***Tetrathemis***), 1941. Kimmins, 1966 : 211.

***sagitta*** Ris (***Orthetrum***), 1915*a* : 216–217. LECTOTYPE ♂. Sierra Leone, Port Lokko, 3.v.1912, *J. J. Simpson*/Orthetrum nov. spec. ♂ (Type) (near africanum)[Ris' writing]/ Orthetrum sagitta Ris, ♂ Lectotype, D. E. Kimmins det. 1967.

The penis of the lectotype was dissected and studied by Dr. K. Buchholz, 1963.

***schumanni*** Calvert (***Micrathyria***), 1906 : 225, 227, pl. 8, figs. 39, 40, pl. 9, fig. 24. Holotype ♂. Guadaljara, Jalisco, July, *Schumann*/Micrathyria schumanni Calv., TYPE. P. P. Calvert det. 1906. B. C. A. Neur., p. 227, Orig. pl. viii, ff. 39, 40, pl. ix, fig. 24.

The ♂ right hamule has been removed and mounted in canada balsam.

***serva*** Kirby (***Trithemis***), 1900 : 69–70, fig. 1. LECTOTYPE ♂ (abd. segs 7–10 missing). Free Town, Sierra Leone, 5.ix.99, *E. E. Austen*/On reverse, T. serva K[WFK].

Kirby is a little obscure in his account of the material upon which this taxon is based. He says 'Described from six specimens, two of them taken by Mr. Austen on Sept. 5 and 21 (1899).' These two specimens are in the collections; one is labelled 'Trithemis serva Cotype' in Kirby's writing, the other (with a red type label) has 'T. serva K' in Kirby's writing on underside of locality label. There is also another Sierra Leone specimen, collected by Morgan, 1835, labelled 'Trith. serva' by Kirby. Three other Free Town examples, collected by Austen, bear no determination labels and I consider them to be excluded from the type series by Kirby's statement that *two* were taken by Austen. One must assume that the other three examples are missing. I have therefore chosen the specimen which originally bore the red type label as Lectotype.

***siamensis*** Fraser (ssp. of ***Onychothemis tonkinensis***), 1932. Kimmins, 1966 : 213.

***siemensi*** Kirby (***Uracis***), 1897 : 605–606, pl. 12, fig. 2. LECTOTYPE ♂. Gurupa, Lower Amazon, 22.ii.96, *E. E. Austen*/siemensi [WFK]/Uracis siemensi holotypus, präp. Dr. Buchholz/Uracis siemensi Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The penis of the lectotype was removed and studied by Dr. H. Buchholz on one of his visits to BM(NH). The 'female from Para' referred to by Kirby is now labelled allotype and the second male (marked cotype by Kirby) has been labelled paralectotype.

***simpsoni*** Ris (***Cyanothemis***), 1915 : 219–221, fig. Holotype ♂ (original designation). Yana, Sierra Leone, 1.iv.1912, *Jas. J. Simpson*/Nov. gen. nov. spec.c, Det. Dr. F. Ris/Cyanothemis simpsoni Ris, ♂ Holotype, D. E. Kimmins det. 1967.

Ris (1919 : 219) refers to this Yana specimen in his description of the subjuvenile ♂ from Mongheri as 'Like first(type) specimen,' and also figures the left wings of the Yana specimen (: 220) as '(type ♂)'. I interpret this as a designation of holotype, although the word holotype is not used.

***sita*** Campion (ssp. of ***Indothemis limbata***), 1923 : 29–31, fig. Holotype ♂. Ceylon, *Yerbury*/ Trincomali, 6.xii.90/Indothemis limbata sita Campion, ♂ Holotype. Determined by H. Campion.

***smithi*** Fraser (***Crocorthetrum***), 1921. Kimmins, 1966 : 213.

***smithi*** Kirby (***Cannacria***), 1894*b* : 266–267. LECTOTYPE ♂. [St. Vincent], Grand Sable (Windward), by pools near sea, Jan. 4/smithii [WFK]/Cannacria smithi Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as synonym of *Brachymesia furcata* Hagen.

***stigmata*** Kirby (***Bradinopyga***), 1893 : 553–554, pl. 41, fig. 3. LECTOTYPE ♂. Ceylon, Trincomalee, 5.viii.90, *Yerbury*/stigmaticum [WFK]/Bradinopyga stigmata Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

***stigmatizans*** Fabricius (***Libellula***), 1775 : 421. Campion, 1917 : 443.

***strachani*** Kirby (***Apeleutherus***), 1900 : 74–75, pl. 2, figs. 4, 4a. LECTOTYPE ♂. Lagos, Dr. *H. Strachan*/Apeleutherus strachani ♂/App. figd [last two labels in Kirby's writing].

Of the long series recorded by Kirby, only the lectotype ♂ and allotype ♀ bear Kirby's determination labels. I have been unable to trace the ♂ from Free Town, 24.viii, listed by Kirby. This taxon is currently placed as *Bradinopyga strachani* (Kirby).

***subpruinosum*** Kirby (***Sympetrum***), 1886 : 326, pl. 33, fig. 7. LECTOTYPE ♀. N.W. Ind[ia] [WFK]/subpruinosum Kirb. type [WFK]/Sympetrum subpruinosum Kirby, ♀ Lectotype, D. E. Kimmins det. 1967.

Currently placed as synonym of *Sympetrum commixtum* Selys.

***sylvia*** Kirby (***Nannothemis***), 1889 : 343–344. Holotype ♀. Beara/N. sylvia type [WFK]. Currently placed in the genus *Oligoclada*.

***terminalis*** Kirby (***Lathrecista***), 1889 : 336. LECTOTYPE ♂. W. Borneo/Lathrecista terminalis ♂ type [WFK]/Lathrecista terminalis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as a synonym of *Lathrecista asiatica* (Fabr.)

***thais*** Kirby (***Perithemis***), 1889 : 324–325. LECTOTYPE ♂. Para/330/thais Kb. type [WFK]/Perithemis thais Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The female, without locality, referred to by Kirby, has not been traced.

***thomasi*** Longfield (***Urothemis***), 1932 : 34–35. Holotype ♂. S. Arabia, Qara Mts., Ain al Rizab, 250 ft., 31.x.1930, *Bertram Thomas*/Urothemis thomasi Longfield, ♂ Holotype.

Miss Longfield's determination label is missing, and a new one has been provided.

***tibialis*** Kirby (***Micrathyria***), 1897 : 610, pl. 13, figs. 5–6. LECTOTYPE ♂. Santarem/ tibialis [WFK]/Micrathyria tibialis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

***tillyardi*** Fraser (***Palaeothemis***), 1923. Kimmins, 1966 : 216.

***torrida*** Kirby (***Pseudomacromia***), 1889 : 340–341, pl. 52, fig. 7. LECTOTYPE ♂. Sierra Leone/Pseudomacromia torrida type [WFK]/Pseudomacromia torrida Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The allotype ♀ (the only one in Kirby's series) is from Sierra Leone and is very teneral, the head now missing. The remaining four syntypes (all males) from Abyssinia, West Africa, Natal and Tenerife, have been traced and are now labelled as paralectotypes. Kirby's statement (: 341) 'Notwithstanding these differences, I am not at present inclined to treat any of these specimens (all of which are males, the only female being described above) as specifically distinct' is considered as definite inclusion of these specimens in the type-series.

***torrida*** Kirby (***Tyriobapta***), 1889 : 338–339, pl. 54, figs. 5–6. LECTOTYPE ♂. W. Borneo/ Tyriobapta torrida type [WFK]/Tyriobapta torrida Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

***trameiformis*** Kirby (***Antidythemis***), 1889 : 315, pl. 51, fig. 4. LECTOTYPE ♂. Para/ Carolina Lin. Cab./Antidythemis trameiformis ♂ type [WFK]/Antidythemis trameiformis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The allotype ♀ bears a label Dythemis? trameiformis Selys, n. sp. ♀, Amazone?

***translucida*** Kirby (***Tramea***), 1889 : 315. Holotype ♀. N. India/translucida Kb. type [WFK].

This taxon is currently placed as a synonym of *Trapezostigma limbata* (Desj.).

***triangularis*** Kirby (***Rhyothemis***), 1889 : 319. LECTOTYPE ♂. Sar[awak] 78/Wallace/ triangularis type [WFK]/Rhyothemis triangularis Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The example in the BM Type collection, although bearing a type-label, proved to be an imposter, bearing a label Sandakan, 29.iii.1893 (four years after publication of the description). The specimen selected above as type was found in the general collection. It is presumed that the false type was transferred to the type collection for evacuation in the summer of 1940 and has remained undetected until the preparation of this type list.

***tricolor*** Kirby (***Orthetrum***), 1893 : 555–556. Holotype ♂. Kandy, 30.vi.92/Ceylon, *Yerbury*/Orthetrum tricolor [WFK].

***trifidum*** Kirby (***Acisoma***?), 1889 : 341. Holotype ♂ (lacking head and right hind wing). Congo/Acisoma ascalaphoides? [in pencil, writing unknown]/Acisoma trifida, type [WFK].

The spelling of the specific name *trifida* has been corrected to *trifidum*.

***tristrigata*** Kirby (***Tetrathemis***), 1889 : 343. Holotype ♀. Gil./Gilolo/T. tristrigata type [WFK].

Currently placed as a synonym of *Tetrathemis irregularis leptoptera* Selys.

***turneri*** Kirby (***Rhyothemis***), 1894 : 17. LECTOTYPE ♂. Queensland, *Turner*/Turneri Kb. ♂ [WFK]/Rhyothemis turneri Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as synonym of *Rhyothemis resplendens* Selys.

***tyleri*** Kirby (***Trithemis***), 1899 : 364, pl. 15, fig. 1. LECTOTYPE ♂. La Chorrera, Panama/ T. Tyleri, Named at sight by W. F. K./Trithemis tyleri Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

***uniformis*** Kirby (***Belonia***), 1889 : 333–334. Holotype ♀. Mex[ico]/uniformis, type [WFK].

Currently placed as a synonym of *Libellula croceipennis* Selys.

***variegatum*** Kirby (***Acisoma***), 1898 : 239–240. LECTOTYPE ♂. Fort Johnston, Nyassaland, *P. Rendall*/variegatum Kirby paratype [Distant's writing]/Acisoma variegatum Kirby, ♂ Lectotype, D. E. Kimmins det. 1961.

Currently placed as a synonym of *Acisoma ascalaphoides* Rambur.

***venusta*** Kirby (***Micrathyria***), 1897 : 612–613, pl. 13, fig. 1. Holotype ♂. Macapá, 25.ii.96/ Macapa, Lower Amazon, 25.ii.96/venusta [WFK].

This taxon is currently placed in the genus *Erythrodiplax*.

***vibrans*** Fabricius (***Libellula***), 1793 : 380. Campion, 1917 : 449–450.

***vittata*** Kirby (***Urothemis***), 1893 : 552, pl. 42, fig. 2. LECTOTYPE ♀. Trincomali, 10.ix.91/ Ceylon, *Yerbury*/vittata type [WFK]/Urothemis vittata Kirby, ♀ Lectotype, D. E. Kimmins det. 1967.

***vittatus*** Kirby (***Hydrobasileus***), 1889 : 314, pl. 51, fig. 10. Holotype ♂. Men[ado]/*Wallace*/ Tramea 4 vittata type [WFK]/Hydrobasileus vittatus Kirby ♂, det. D. E. Kimmins, 1967.

The name *Tramea quadrivittata* Hag. MS is quoted by Kirby in synonymy of *Hydrobasileus vittatus* Kirby.

***vivax*** Calvert (***Brechmorhoga***), 1906 : 279, 280, pl. 8, fig. 46. Holotype ♂. Zapote, Guatemala, *Champion*/Brechmorhoga vivax Calvert, TYPE. P. P. Calvert det. 1906. B. C. A. Neur. p. 280. Original of Pl. viii, f. 46.

***wilsoni*** Pinhey (***Brachythemis***), 1952 : 16, fig. 5A. Holotype ♂. Xambio, S. Sudan, xii. 1950, *C. E. Wilson*/Brachythemis ?sp. nov. E. Pinhey det. 1951/Brachythemis wilsoni Pinh. ♂.

***woodfordi*** Kirby (***Nesocria***), 1889 : 335. Holotype ♂. [Solomon Islands], Alu/Nesocria woodfordi type [WFK].

Currently placed in the genus *Protorthemis*.

***yerburyi*** Kirby (***Tetrathemis***), 1893 : 556–557, pl. 41, fig. 4. LECTOTYPE ♂. Kandy, 30.vi.92. B. in coitu A/Ceylon, *Yerbury*/yerburii type [WFK]/Tetrathemis yerburyi Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

The specific name, spelt *yerburii* by Kirby, has been emended to *yerburyi*.

### Family CORDULIIDAE

***aculeata*** Fraser (***Macromia***), 1927. Kimmins, 1966 : 176.

***aeneothorax*** Nunney (***Ceratogomphus***?), 1895 : 349–351, figs. A, B. Holotype ♂ (one sup. app. and inf. app. glued to card). Ceratogomphus aeneothorax Nunney mss, on reverse 'Sierra Leone' and TYPE.

I do not recognise the writing (in red ink) of the locality 'Sierra Leone'. Currently placed in the genus *Macromia*.

***annaimallaiensis*** Fraser (***Macromia***), 1931. Kimmins, 1966 : 178.

***atrifrons*** McLachlan (***Syncordulia***), 1883 : xc–xci. Holotype ♀. Queensland/Type [McL. label]/Syncordulia atrifrons McL.

Currently placed in the genus *Micromidia*.

***atuberculata*** Fraser (***Macromia***), 1922. Kimmins, 1966 : 180.

***aurolineata*** Tillyard (ssp. of ***Metathemis guttata***), 1913 : 575. LECTOTYPE ♂. Dorrigo, N.S.W., *R. J. Tillyard*, 4.xii.1911/Metathemis guttata aurolineata Tillyard, TYPE ♂, R.J.T./ Metathemis guttata aurolineata Till., ♂ Lectotype, D. E. Kimmins det. 1968.

Currently placed as *Eusynthemis guttata aurolineata* (Tillyard).

***bellicosa*** Fraser (***Macromia***), 1924. Kimmins, 1966 : 181.

***berthoudi*** Tillyard (***Hesperocordulia***), 1911 : 376–378, pl. 10, figs. 1, 3, 9. LECTOTYPE ♂. Waroona, W. A[ustralia], *G. F. Berthoud*, 27.xi.1909/Hesperocordulia Berthoudi [*sic*] Till., ♂ TYPE, R.J.T./Hesperocordulia berthoudi Till., ♂ Lectotype, D. E. Kimmins det. 1968.

***binocellata*** Fraser (***Macromia***), 1924. Kimmins, 1966 : 183.

***bispina*** Fraser (***Macromia***), 1954. Kimmins, 1966 : 183.

***braueri*** Selys (***Epitheca***), 1871 : 284–285. Holotype ♂. N[ew] Zeal[and]/24/Cordulia Braueri de Selys/Type [McL. label]/Epitheca braueri Selys, ♂ Holotype, D. E. Kimmins det. 1967.

Placed by Fraser, 1939, in his genus *Antipodochlora*.

**burliyarensis** Fraser (ssp. of ***Idionyx corona***), 1922. Kimmins, 1966 : 184.

**canis** McLachlan (***Tetragoneuria***), 1886 : 104–105. Holotype ♂. [Western North America] Washington Territory [*K. H. Morrison*]/Type [McL. label]/Tetragoneuria canis McL.

**circularis** Tillyard (***Pseudocordulia***), 1908 : 743, pl. 22, fig. 1. Holotype ♂. Kuranda, N.Q., xii.07, *F. P. Dodd*/Pseudocordulia circularis Till., ♂ TYPE, R.J.T.

**claviculata** Tillyard (***Synthemis***), 1908*b* : 749–750, pl. 22, fig. 5. Holotype ♂. Kuranda, N. Q., i.08, *E. Allen*/Synthemis claviculata Till., ♂ TYPE, R.J.T.

**contumax** Selys (***Phyllomacromia***), 1879 : 103–104. Holotype ♂ (right fore wing, both hind wings somewhat damaged). West Africa, Akele/Type [McL. label]/Phyllomacromia contumax, Selys [McL. hand ].

Currently placed in the genus *Macromia*.

**corona** Fraser (***Idionyx***), 1921. Kimmins, 1966 : 187.

**corycia** Laidlaw (***Macromia***), 1922 : 220, 225, fig. 5. Holotype ♂. Sarawak, Ulu Baram 3.xi.1920, *J. C. Moulton*/Macromia corycia sp. n. ♂ Type, det. F. F. Laidlaw.

The original paper label, in Laidlaw's handwriting, gives the date wrongly as 3.xi.30.

**costalis** Selys (***Cordulia***), 1871 : 273. Holotype ♀. Georgia/Cordulia costalis de Selys/C. costalis De Selys ♀.

Currently placed as a synonym of *Tetragoneuria cynosura* (Say).

**cupricincta** Fraser (***Macromia***), 1924. Kimmins, 1966 : 187.

**cupricolor** Fraser (***Hemicordulia***), 1927. Kimmins, 1966 : 187.

**cyanitincta** Tillyard (***Synthemis***), 1907 : 724–726, pl. 35, figs. 3–4, pl. 36, fig. 1. LECTOTYPE ♂. Margaret R., W. A., i.07, *R. J. Tillyard*/Synthemis cyanitincta Till., ♂ TYPE, R.J.T./Synthemis cyanitincta Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

**cydippe** Laidlaw (***Macromia***), 1922 : 220–222, 223, figs. 2, 3. Holotype ♂. Sarawak, Lio Matu, 3.x.1914, *J. C. Moulton*/Macromia cydippe Laidlaw, ♂ Type.

**cyrene** Lieftinck (***Synthemis***), 1953*a* : 78–81, figs. 5–9. Holotype ♂. N. E. New Guinea, Saiko, 5,500–6,000 ft., Babu River (Upper Waria River), ix–x.1936/*F. Shaw-Mayer*/Synthemis cyrene sp. n. ♂.

**divergens** Tillyard (***Cordulephya***), 1917 : 467–469, pl. 23, figs. 9–10, text-fig. 6. LECTOTYPE ♂. Hornsby, N.S.W., 8.v.16, *R. J. Tillyard*/Cordulephya divergens Till., ♂ TYPE, R.J.T./Cordulephya divergens Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

**donaldi** Fraser (***Indomacromia***), 1924. Kimmins, 1966 : 189.

**elliptica** Tillyard (***Pseudocordulia***), 1913*b* : 229–230, pl. 15, figs. 1–2. LECTOTYPE ♂. Kuranda, N. Q[ueensland], *F. P. Dodd*, 3.i.1913/Pseudocordulia elliptica Tillyd., ♂ TYPE, R.J.T./Pseudocordulia elliptica Till., ♂ Lectotype, D. E. Kimmins det. 1968.

**ellisoni** Fraser (***Macromia***), 1924. Kimmins, 1966 : 190.

**elongata** Campion (***Metaphya***), 1921 : 64–66, pl. 9, fig. 17. Holotype ♀. Loc. Baie Ngo, no. 204, 10.ii.14. Coll. P. D. Montague, New Caledonia Exped./New Caledonia, *P. D. Montague*/Metaphya elongata Campion, Holotype, Determined by H. Campion.

**euterpe** Laidlaw (***Macromia***), 1915 : 26–29, figs. 1–2. LECTOTYPE ♂. Kina Balu, British North Borneo, *J. C. Moulton*/M. euterpe Type ♂, 12.ix.13, 7 [Laidlaw's writing]/Macromia euterpe Laidlaw, ♂ Lectotype, D. E. Kimmins det. 1967.

The example chosen as Lectotype has for many years been labelled 'Type H.T.', but was not so designated in print by Laidlaw.

**evelynae** Lieftinck (***Synthemis***), 1953*a* : 81–84, figs. 10–11. Holotype ♂ (abd. segs. 6–10 and anal appendages wanting). Papua, Mafulu, 4,000 ft., xii.1933, *L. E. Cheesman*/Synthemis evelynae sp. n. ♂.

***fallax*** McLachlan (***Gomphomacromia***), 1881 : 141–142. LECTOTYPE ♂. Intaj, Ecuador/ Gomphomacromia fallax McL./Type [McL. label]/Gomphomacromia fallax McL., ♂ Lectotype, D. E. Kimmins det. 1967.

***fenella*** Campion (***Synthesis***), 1921 : 61–62, pl. 9, fig. 16. text-fig. 11. Holotype ♂. Loc. Mt. Mou, No. 725, Date 20.iii.14. Coll. *P. D. Montague*, New Caledonia Exped./Synthemis fenella Campion, Holotype. Determined by H. Campion.

***fidelis*** McLachlan (***Hemicordulia***), 1886 : 104. Holotype ♂. [Loyalty Isls.] Uvea/Type [McL. label]/Hemicordulia fidelis McLach.

***flavicauda*** McLachlan (***Nesocordulia***), 1882 : clxx–clxxii. Holotype ♂. Madagascar/ Nesocordulia flavicauda McL./Type [McL. label].

***flavicincta*** Kirby (***Phyllomacromia***), 1898 : 241–242. LECTOTYPE ♂. Rustenberg, *W. L. D[istant]*/flavicincta (type) Kirby [Distant's writing]/Macromia picta Selys H. C[ampion]/ Phyllomacromia flavicincta Kirby, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed in the genus *Macromia*, where it is a junior homonym of *M. flavicincta* Selys and a synonym of *Macromia picta* (Selys).

***flavicincta*** Selys (***Macromia***), 1874 : 25–27. LECTOTYPE ♂. North Ind[ia]/Macr. flavicincta de Selys/Macromia flavicincta Selys, ♂ Lectotype, D. E. Kimmins det. 1967.

The male chosen as Lectotype has for may years been labelled Holotype, but it was not so indicated in print by Selys. The original description gives 'Nord du Bengale' as locality, but it is only the ♀ which is so labelled.

***flavocolorata*** Fraser (***Macromia***), 1922. Kimmins, 1966 : 192.

***flavovittata*** Fraser (***Macromia***), 1935. Kimmins, 1966 : 192.

***flexicauda*** Campion (***Synthemis***), 1921 : 57–61, pl. 8, fig. 14, pl. 9, fig. 15, text-fig. 10. Holotype ♂. Loc. Mt. Nekando, Date, 24.v.14, Coll. P. D. Montague, New Caledonia Exped./ New Caledonia, *P. D. Montague*/Synthemis flexicauda Campion ♂. Holotype. Determined by H. Campion.

***fulva*** Laidlaw (***Macromidia***), 1915 : 29–30, fig. 3. Holotype ♂. Borneo, *J. C. Moulton*/ Macromidia fulva, ♂ Laidlaw, TYPE. Kina Balu, Borneo, 11.ix.1913, *J. C. Moulton*.

***fulvia*** Fraser (ssp. of ***Idionyx corona***), 1924. Kimmins, 1966 : 193.

***galeata*** Fraser (***Idionyx***), 1924. Kimmins, 1966 : 193.

***genialis*** Laidlaw (***Macromidia***), 1923 : 232. Holotype ♂. Malay Peninsula, Pahang, Gunong Tahan, 10.xii.1921/Macromidia genialis ♂ Type [Laidlaw's writing].

***gomphomacromioides*** Tillyard (***Synthemiopsis***), 1917 : 464–467, pl. 23, figs. 7–8, text-figs 4–5. LECTOTYPE ♂. Cradle Mt., Tas., *R. J. Tillyard*, 18.i.17/Synthemiopsis gomphomacromioides Till., ♂ TYPE, R.J.T./Synthemiopsis gomphomacromioides Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

***gracillima*** Fraser (***Hemicordulia***), 1944. Kimmins, 1966 : 194.

***halei*** Fraser (***Macromia***), 1928. Kimmins, 1966 : 194.

***ida*** Fraser (***Macromia***), 1924. Kimmins, 1966 : 196.

***imbricata*** Fraser (***Idionyx***), 1926. Kimmins, 1966 : 196.

***indica*** Fraser (***Macromia***), 1924. Kimmins, 1966 : 197.

***insignis*** Kirby (***Pseudogomphus***), 1889*a* : 299. Holotype ♂. Cameroons/Pseudogomphus insignis [WFK].

Currently placed as a synonym of *Macromia sophia* Selys. The tenth abdominal degment and anal appendages are detached.

***insularis*** Kimmins (***Guadalca***), 1957*a* : 318–319, figs. 3–4. LECTOTYPE ♂. Solomon Is., Guadalcanal, Tapenanje, 10–23.xii.1953, *J. D. Bradley*/Guadalca insularis Kim., ♂ Type, D. E. Kimmins det. 1955/Guadalca insularis Kimmins, ♂ Lectotype, D. E. Kimmins det. 1967.

***intricata*** Fraser (***Idionyx***), 1926. Kimmins, 1966 : 198.

***irata*** Fraser (***Macromia***), 1924. Kimmins, 1966 : 198.

***junior*** Pinhey (ssp. of ***Macromia kimminsi***), 1961 : 116, pl. 8, figs. 10, 15, 16. Holotype ♂. *van Someren*, Broderick Falls, Scarp, Kenya, v.51/Macromia kimminsi junior Pinh. HOLOTYPE.

***kimminsi*** Fraser (***Macromia***), 1954. Kimmins, 1966 : 199.

***kimminsi*** Lieftinck (***Synthemis***), 1953*a* : 75–78, figs. 1–4. Holotype ♂. N.E. New Guinea, Saiko, 5,500–6,000 ft., Babu River (Upper Waria River), 24.x.1936/*F. Shaw Mayer*/Synthemis kimminsi sp. n.

***laidlawi*** Fraser (***Idionyx***), 1936. Kimmins, 1966 : 200.

In my paper (1966), the reference to this species was omitted. It should be 1936*a* : 701.

***leachi*** Selys (***Synthemis***), 1871*a* : 561. Holotype ♂. N[ew] Holland/Cord. Leachii ♂ Selys/Synth. Leachii de Selys.

The left hind wing is missing and the other wings are somewhat battered. The specific name has been emended to 'leachi'.

***leoni*** Fraser (***Phyllomacromia***), 1928. Kimmins, 1966 : 200.

***lieftincki*** Fraser (***Macromia***), 1954. Kimmins, 1966 : 201.

***magnifica*** Selys (***Macromia***), 1874 : 22–24. LECTOTYPE ♀. N. California, *Walsingham*/Macromia magnifica ♀ [Selys' writing]/Macromia magnifica Selys, ♀ Lectotype, D. E. Kimmins det. 1967.

The ♂ syntype of this species has not been traced in the McLachlan collection. The ♀ was found (without any type label) and has been designated Lectotype. Selys gives no indication that he retained the ♂, and Martin (1906 : 67) writes 'Types ♂ et ♀ coll. MacLachlan'.

***malabarensis*** Fraser (***Epophthalmia***), 1935. Kimmins, 1966 : 203.

***malayana*** Laidlaw (ssp. of ***Macromia moorei***), 1928 : 133–134. Holotype ♂. Pahang, L. Tamang, 13.vi.1923, *F. N. Chasen*/Macromia moorei malayana n. subsp. [Laidlaw's writing]/Macromia moorei malayana ♂ Holotype, Laidlaw [DEK].

Currently placed as synonym of *Macromia moorei fumata* Kruger.

***marginata*** Selys (***Somatochlora***?), 1883 : 109–110. Holotype ♂ (head lacking). Japan/Type [McL. label]/Somatochlora? marginata Selys, ♂, Japon [Selys' writing].

Currently placed in the genus *Epitheca*.

[***martini*** Tillyard (***Synthemis***), 1907 : 726–728, pls. 35, figs. 1–2 and 36, fig. 2.]

There are no examples of this species in BM(NH) collection. The types may perhaps still be in Canberra.

***mascarenica*** Fraser (***Nesocordulia***), 1948. Kimmins, 1966 : 203.

***melanosoma*** Tillyard (ssp. of ***Metathemis guttata***), 1913*b* : 231–233. LECTOTYPE ♂. Tambourine, Q[ueensland], *R. J. Tillyard*, 24.xii.1912/Metathemis guttata melanosoma Tillyd., ♂ TYPE, R.J.T./Metathemis guttata melanosoma Till., ♂ Lectotype, D. E. Kimmins det. 1968.

Currently placed as *Eusynthemis guttata melanosoma* (Tillyard).

***metallica*** Tillyard (***Lathrocordulia***), 1911 : 379–380, pl. 10, figs. 2, 4 and 10. LECTOTYPE ♂. Waroona, W. A[ustralia], *G. F. Berthoud*, 3.xii.1910/Lathrocordulia metallica Till., ♂ TYPE, R.J.T./Lathrocordulia metallica Till., ♂ Lectotype, D. E. Kimmins det. 1968.

The lectotype lacks the apex of the left superior anal appendage.

***micans*** Laidlaw (***Metaphya***), 1912 : 2–3, pl. 1. Holotype ♂. Sarawak, 1910/Metaphya micans Type ♂ [Laidlaw's writing].

The allotype ♀ was described later (*Proc. zool. Soc. Lond.* **1913** : 65–67).

***minima*** Fraser (***Idionyx***), 1931. Kimmins, 1966 : 204.

***montaguei*** Campion (***Synthemis***), 1921 : 55–57, pl. 8, fig. 13, text-fig. 9. Holotype ♂. Loc. Alt Mou, Date, 10.iii.14 (No. 488), Coll. P. D. Montague, New Caledonia Exped./New Caledonia, *P. D. Montague*/Synthemis montaguei Campion, ♂, Holotype. Determined by H. Campion.

***montana*** Tillyard (***Cordulephya***), 1911*a* : 392–397, pls. 11–12. Holotype ♂. [Medlow], Blue Mts., N.S.W., 19.i.10, *R. J. Tillyard*/Cordulephya montana Till., ♂ TYPE, R.J.T.

Holotype ♂ specified by Tillyard (1911 : 397, line 14, 'type-male'). The locality 'Medlow' is given in the text in several places but not on the locality label.

***moorei*** Selys (***Macromia***), 1874 : 28. Holotype ♂. Himalaya/Macromia moorei Selys ♂, n. sp.

***mystica*** Tillyard (***Austrophya***), 1908*b* : 739–740, pl. 31, fig. 1. Holotype ♀. Kuranda, N. Q., i.08, *F. P. Dodd*/Austrophya mystica Till., TYPE ♀, R.J.T.

***nadganiensis*** Fraser (***Idionyx***), 1924. Kimmins, 1966 : 205.

***nasalis*** Selys (***Epitheca***), 1874 : 21. Holotype ♀. North America/Epith. nasalis de Selys mss., var. d'albicincta B.? [Selys' writing].

This example has at some time lost its locality label and a new one has been provided. Currently placed in the genus *Somatochlora*.

***nigra*** Tillyard (***Synthemis***), 1906 : 489–491. LECTOTYPE ♂ (lacking most of left hind wing). Kuranda, N. Q., i.05, *R. J. Tillyard*/Synthemis nigra Till. ♂ TYPE, R.J.T./Synthemis nigra Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed in the genus *Eusynthemis*.

***nilgiriensis*** Fraser (ssp. of ***Idionyx corona***), 1922. Kimmins, 1966 : 206.

***nilgiriensis*** Fraser (***Phyllomacromia***), 1918. Kimmins, 1966 : 207.

***occidentalis*** Tillyard (ssp. of ***Synthemis macrostigma***), 1910 : 355. LECTOTYPE ♂. Bridgetown, W. A., i.07, *R. J. Tillyard*/Synthemis macrostigma Selys, subsp. occidentalis Till., ♂ TYPE, R.J.T./Synthemis macrostigma occidentalis Till., ♂ Lectotype, D. E. Kimmins det. 1967.

***olivei*** Tillyard (***Synthemis***), 1908*b* : 747–749, pl. 22, fig. 4. LECTOTYPE ♂. Cooktown, N. Q., i.08, *R. J. Tillyard*/Synthemis olivei Till., ♂ TYPE, R.J.T./Synthemis olivei Tillyard, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed in the genus *Choristhemis*.

***orientalis*** Tillyard (ssp. of ***Synthemis macrostigma***), 1910 : 355. LECTOTYPE ♂. Blue Mts., N.S.W., ii.05, *R. J. Tillyard*/Synthemis macrostigma Selys, subsp. orientalis Till., ♂ TYPE/Synthemis macrostigma orientalis Till., ♂ Lectotype, D. E. Kimmins det. 1967.

***ornata*** Fraser (***Idionyx***), 1921. Kimmins, 1966 : 208.

***pacifica*** Fraser (***Hemicordulia***), 1925. Kimmins, 1966 : 208.

***pallida*** Fraser (***Macromia***), 1924. Kimmins, 1966 : 208.

***periyashola*** Fraser (***Idionyx***), 1939. Kimmins, 1966 : 209.

***piscator*** Barnard (***Presba***), 1934 : 168, figs. 1f–h, 2. LECTOTYPE ♂. Groot Drakenstein, Cape Province, xii.1932, *A. C. Harrison*/Presba piscator Barnard ♂ TYPE [DEK]/Presba piscator Barnard, ♂ Lectotype, D. E. Kimmins det. 1967.

***pseudafricana*** Pinhey (***Macromia***), 1961 : 109, pl. 8, fig. 5. Holotype ♂. Aswe R., Karamoja Suk, Uganda, iv.1952/Macromia africana Selys, E. Pinhey det. 1952/Macromia africana Selys, F. C. Fraser det. 1953/Macromia pseudafricana Pinh. HOLOTYPE.

Pinhey states that Fraser's determination was made 'with reservation'.

***pygmaea*** Selys (***Cordulephya***), 1871 : 316. Holotype ♂. Melbourne, *Edwards*/122/Cordulephia pygmaea Selys ♂/Type [McL. label].

***refracta*** Tillyard (***Austrocordulia***), 1908*b* : 744–745, pl. 22, fig. 2. Holotype ♂. Cooktown, N. Q., i.08, *R. J. Tillyard*/Austrocordulia refracta Till., ♂ TYPE, R.J.T.

***regina*** Selys (***Synthemis***), 1874 : 31–33. LECTOTYPE ♂. N[ew] S[outh] W[ales]/Synth. regina de Selys/Synthemis regina Selys, ♂ Lectotype, D. E. Kimmins det. 1967.

Selys gives as locality 'Queensland', but the BM(NH) specimen, which he lists first, is labelled New South Wales, the MacLachlan examples being from Queensland. Currently placed in the genus *Eusynthemis*.

***rhinoceroides*** Fraser (***Idionyx***), 1934. Kimmins, 1966 : 211.

***rutherfordi*** Selys (***Neophya***), 1881 : xvii–xviii, 1 fig. Holotype ♂. Old Calabar, R[utherford]/Type[McL. label]/Neophya Rutherfordi Selys.

***saffronata*** Fraser (***Idionyx***), 1924, Kimmins, 1966 : 212.

***selysi*** Fraser (***Idionyx***), 1926 : 201–202, pls. 9, fig. 6 and 10, fig. 6. LECTOTYPE ♂. I. selysi ♂. Maymyo, Upper Burma, 15.vi.24. Col. *F. Wall* coll. [F.C.F.]/Idionyx selysi Fraser. ♂ Lectotype, D. E. Kimmins det. 1967.

Through an unfortunate oversight, this species was omitted from my 1966 paper. The above example has been chosen as Lectotype, in preference to the example in the Selys collection, which Fraser appears not to have seen.

***selysi*** Kirby (***Macromia***), 1900 : 77–78. Holotype ♂. Sierra Leone, Free Town, 16.ix.99, *E. E. Austen*/M. Selysi type [WFK].

***shanensis*** Fraser (***Macromidia***), 1927. Kimmins, 1966 : 213.

***smithi*** White (***Cordulia***), 1845, pl. 6, fig. 2; Selys, 1871 : 261. Holotype ♀. New Zealand/Cordulia Smithii White, Zool. Ereb. & Terror, t. . ., f. . . [A. White's writing].

The first reference to this species is the plate reference given above. The first description is that of Selys, 1871. Currently placed in the genus *Procordulia*.

***sophia*** Selys (***Macromia***), 1871*a* : 550–551. Holotype ♂. Cape Coast Castle [Guinea]/124/Type [McL. label]/Macromia sophia ♂ Selys [Selys' writing].

***spiniger*** Tillyard (***Synthemis***), 1913 : 572–574, pl. 62, figs. 15–16. Holotype ♂. Waroona, W. A[ustralia], *G. F. Berthoud*, 27.i.1912/Synthemis spinifer [*sic*] Tillyard, TYPE ♂, R.J.T./Synthemis spiniger Till., ♂ Holotype, D. E. Kimmins det. 1968.

The specific name was published as 'spiniger' and used consistently five times in the original publication.

***stevensi*** Fraser (***Idionyx***), 1924. Kimmins, 1966 : 214.

***subjuncta*** Tillyard (ssp. of ***Metathemis brevistyla***), 1913 : 574, pl. 62, fig. 1b. LECTOTYPE ♂. Dorrigo, N.S.W., *R. J. Tillyard*, 6.xii.1911/Metathemis brevistyla subjuncta Tillyard, TYPE ♂, R.J.T./Metathemis brevistyla subjuncta Till., ♂ Lectotype, D. E. Kimmins det. 1968.

Currently placed as *Eusynthemis brevistyla subjuncta* (Tillyard).

***superba*** Tillyard (***Hemicordulia***), 1911 : 368–370, pl. 10, figs. 5–8. LECTOTYPE ♂. Pallal, N.S.W., *R. J. Tillyard*, 13.xii.1910/Hemicordulia superba Till., ♂ TYPE, R.J.T./Hemicordulia superba Till., ♂ Lectotype, D. E. Kimmins det. 1968.

***sylvatica*** Fraser (***Macromia***), 1954. Kimmins, 1966 : 215.

***tasmanica*** Tillyard (***Synthemis***), 1910 : 344–347, pls. 4, fig. 2 and 7, figs. 2, 20. LECTOTYPE ♂. St. Patrick's R., Tas., 7.i.09, *R. J. Tillyard*/Synthemis tasmanica Till., ♂ TYPE, R.J.T./Synthemis tasmanica Till., ♂ Lectotype, D. E. Kimmins det. 1967.

***thalia*** Lieftinck (***Macromia***), 1929 : 103–104, fig. 29. Holotype ♂. Khasia Hills/Macromia thalia nov. nom., ♂ Holotype, vid. Lieftinck, '28 [Lieftinck's writing]./Macromia thalia Lieftinck, ♂[DEK].

This specimen was originally determined as *Macromia ?fraenata* Laidlaw, by Laidlaw.

***thetis*** Ris (***Macromia***), 1921 : 379–381, figs. 65–66. LECTOTYPE ♂. Chirinda For., Gazal[and], 3,600 ft., 9.x.1905, *G. A. K. Marshall*/Macromia spec. *a*, Det. Dr. F. Ris, Phyllomacromia aequatorialis Martin?/Macromia thetis Ris ♂, det. Miss C. Longfield, 1934./ Macromia thetis Ris, ♂ Lectotype, D. E. Kimmins det. 1968.

With this type and the allotype ♀ is a mss. note by Miss Longfield. 'These are believed to be the types of *Macromia thetis* Ris, described 1921, in Ann. S. African Mus. Found with all labels as at present, except type labels and determination labels of Miss C. Longfield'.

The female in the South African Museum was excluded from the type series by Ris' reference (p. 381) to the 'typical pair in the British Museum'.

***tillyardi*** Martin (***Macromia***), 1906 : 72. Holotype ♀. Kuranda, i.05/Macromia tillyardi Martin, ♀ TYPE, R.J.T.

Although Tillyard (1906 : 491) records the capture of three females, only one, 'the type-specimen' was sent to Martin and is therefore automatically the holotype

***travencorensis*** Fraser (***Idionyx***), 1931. Kimmins, 1966 : 216.

***trituberculata*** Fraser (***Macromia***), 1921. Kimmins, 1966 : 216.

***unguiculata*** Fraser (***Idionyx***), 1926. Kimmins, 1966 : 217.

***venator*** Barnard (***Presba***), 1933 : 167, figs. 1a–e. LECTOTYPE ♂. French Hoek, C[ape] P[rovince], with on reverse, K. H. Barnard, xii.1932/Presba venator Barnard, ♂ TYPE [DEK]/ Presba venator Barnard, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed as a synonym of *Syncordulia gracilis* (Burm.).

***virgula*** Selys (***Synthemis***), 1874 : 33–34. LECTOTYPE ♂. S. Austral[ia], Bakewell/Synth. virgula de Selys/Synthemis virgula Selys, ♂ Lectotype, D. E. Kimmins det. 1967.

Currently placed in the genus *Eusynthemis*.

***viridescens*** Tillyard (***Macromia***), 1911 : 380–381, pl. 10, fig. 11. Holotype ♂. Cape York, N. Q[ueensland], *H. Elgner*, 22.xi.1909/Macromia viridescens Till., ♀ TYPE, R.J.T./'This is said to be the ♀ of M. terpsichore Foerster. Tillyd., Proc. Linn. Soc. N.S.W., Vol. xxxvii, 1912, p. 584' [F. C. Fraser's writing].

Currently placed as a synonym of *Macromia terpsichore* Foerster.

***whitei*** Selys (***Macromia***), 1871a : 555. LECTOTYPE ♂. N. India/Macr. Whitei ♂ De Selys [Selys' writing]/Macromia whitei Selys, ♂ Lectotype, D. E. Kimmins det. 1967.

The BM(NH) collection contains 1 ♂, 1 ♀ of this species, labelled by Selys in writing very similar to that on the label of *Synthemis leachi*, described in the same publication. Selys quotes an unspecified number of examples in 'Coll. Selys et Brit. Mus.' Our examples are labelled N. India, which would certainly include part of Bengal. The species is almost certainly named after Dr. Adam White, a previous Keeper of the Zoological Department of the British Museum and one assumes therefore that our examples would be the types. Martin (1906 : 70–71) mentions types of *M. cingulata* Rambur (of which *whitei* is a synonym) in the Selys Collection, but not of *whitei*. I do not know of any previous designation of a type for this species and have therefore selected our ♂ (as above) as Lectotype.

***wollastoni*** Campion (***Synthemis***), 1915 : 486–488, figs. 38–39. Holotype ♀. Dutch New Guinea, *A. F. R. Wollaston*/Snow Mts. 4,000 to 6,000 ft., i–ii.1913/Synthemis wollastoni Cmpn., ♀ Holotype, Determined by H. Campion.

The description gives the additional data, Utakwa River, not mentioned on the printed labels.

***xanthosticta*** Tillyard (ssp. of ***Metathemis nigra***), 1913*b* : 230–231. LECTOTYPE ♂. Tambourine, Q[ueensland], *R. J. Tillyard*, 5.i.1913/Metathemis nigra xanthosticta Till., ♂ Lectotype, D. E. Kimmins det. 1968.

Currently placed as *Eusynthemis nigra xanthosticta* (Tillyard).

***zeylanica*** Fraser (***Macromia***), 1927. Kimmins, 1966 : 219.

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BRITISH MUSE
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D. HOLLIS

BULLETIN OF
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ENTOMOLOGY Vol. 22 No. 7
LONDON : 1968

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BY

D. HOLLIS
Anti-Locust Research Centre, London

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*By* D. HOLLIS

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## SYNOPSIS

The genus *Aiolopus* is redescribed and defined, and notes are given on its biology. A key is given to the seven species and six subspecies included within the genus, and all of these are redescribed.

## INTRODUCTION

FOR the past century the genus *Aiolopus* has been a source of anxiety to acridid taxonomists. It arose in confusion through being described twice in the same year, first as *Aiolopus* (Fieber, 1853, May) and then as *Epacromia* (Fischer, 1853, November), and its species have since been continually confused with one another.

Up to 1938 even the familiar association of *Aiolopus* was in doubt but firstly Zimin (1938 : 27) and later Uvarov (1942 : 336) placed the genus naturally in the subfamily Oedipodinae (here considered a part of the Acridinae) close to *Encoptolophus* and *Hilethera*. At the same time Uvarov (1942 : 337) erected two genera, *Platypygius* and *Epacromius*, from species previously included in *Aiolopus*.

In recent decades it has become increasingly obvious that the species of *Aiolopus* can and are becoming serious crop pests, being particularly able to adapt from their natural grassland savannah habitat to irrigated crop areas.

In the light of this knowledge and the confused state of the systematics of the genus it became clear that some form of revisionary work was necessary. The present paper attempts to revise the genus taxonomically and to introduce stability of identification of the species concerned.

Immediately prior to this work the genus was thought to contain seventeen recognizable species. In a previous paper (Hollis, 1967) the author transferred two of these species to other genera. The present paper recognizes seven species, including one newly combined species, with four others reduced to subspecific status and the remaining five sunk into synonymy.

All available types have been studied and where a type is lost or is inaccessible due to institutional policy this is clearly stated. If a type of a recognized species is destroyed a neotype is erected in the interests of stability of the nomenclature and where a species is based upon a series of syntypes a lectotype is erected from that series.

Distribution of the recognized species and subspecies is only considered in the light of material studied by the present author. Previous records are not considered, unless checked, because of the confusion which would arise from past misidentification and misapplication of names. For most species a large amount of material was studied and their distribution is presented in map form with notes on the countries in which each is found and the months of its known occurrence.

Type depositories are given in abbreviated form as follows:

Berlin—Zoologisches Museum der Universität, Berlin.
BM(NH)—British Museum (Natural History), London.
Copenhagen—Universitetets Zoologiske Museum, Copenhagen.
Leningrad—Zoological Institute, Academy of Sciences of USSR, Leningrad.
Maastricht—Natuurhistorisch Museum, Maastricht.
Madrid—Instituto Español de Entomologia, Madrid.
Paris—Museum National d'Histoire Naturelle, Paris.
Stockholm—Naturhistoriska Riksmuseum, Stockholm.
Turin—Istituto e Museo di Zoologia, Torino.
Uppsala—Zoologiska Institutionen, Uppsala Universitet, Uppsala.

Measurements and abbreviations of measurements used in this paper follow those of Dirsh (1953).

Abbreviations used in the phallic complex figures are as follows: Ac—arch of cingulum; Ap—apical valve of penis; Apd—apodeme of cingulum; Bp—basal valve of penis; Cv—cingular valve; Dp—dorsal process of cingulum; Ejd—ejaculatory duct; Ejs—ejaculatory sac; Gpr—gonopore process; Rm—ramus of cingulum; Sps—spermatophore sac.

The opportunity is taken here to thank the Keeper of Entomology of the British Museum (Natural History) for allowing me to study the mass of material in his care; Dr. T. H. C. Taylor for editing the manuscript; and the following colleagues for loans and information concerning type material; Professor G. Ya. Bei-Bienko, Leningrad; Professor J. van Boven, Leuven; Dr. M. Descamps, Paris; Dr. K. K. Günther, Berlin; Dr. L. Hedström, Uppsala; Professor J. O. Hüsing, Halle (Saale); Dr. K. H. L. Key, Canberra; Professor E. Morales—Agacino, Madrid; the late Dr. B. Hanson, Stockholm; Dr. B. Petersen, Copenhagen; Professor M. Salfi, Naples; and Dr. F. Willemse, Eygelshoven.

## BIOLOGY

There is no major study on the biology of the species of *Aiolopus* available, but many authors have studied specific items of the biology of the more common species such as *A. thalassinus* and *A. simulatrix* (as *A. savignyi*).

Chesler (1938) studied the life history and described the immature stages of *A. thalassinus* in the Transvaal, and Hafez *et al.* (1962*a*) studied the same species in Egypt, both papers reporting that successful digging and oviposition took place in wet soil. Khalifa (1956), studying the egg-pods of *A. thalassinus* and *A. simulatrix*, mentions that a higher percentage of *simulatrix* than of *thalassinus* will oviposit on dry soil and the eggs of both species will develop without contact water as, provided they are in an atmosphere of 100 % humidity, they can absorb enough moisture from the atmosphere for development.

Zimin (1938) describes egg-laying and the egg-pods of *thalassinus* in southern Russia; Chapman & Robertson (1958) describe the egg-pods of *thalassinus* and *longicornis* in the Rukwa Valley, and Chapman (1961) describes those of *thalassinus* from Ghana; and Descamps & Wintrebert (1967) describe the egg-pods, eggs, copulation and oviposition of *A. rodericensis* (Butler) and suggest three to four generations per year for this species in S.W. Madagascar.

Joyce (1952) records that *A. simulatrix* in the Sudan overwinters as adults in soil cracks and the present author confirms the presence of this species in soil cracks in the Sudan at the onset of winter. Khalifa (1956) states that in Egypt, where the winter is more severe, *simulatrix* overwinters in the egg stage, but *thalassinus* breeds throughout the year. This latter fact is verified for other regions by Nolte (1939) and Chapman (1962). Roffey (1965) suggests that, in Thailand, *A. thalassinus tamulus* undergoes more than one generation per year and does not overwinter in the egg stage.

Joyce (1952 and 1954), studying the general biology of *simulatrix* in the Sudan, describes the formation of loose swarms and seasonal migration by this species. Khalifa (1956) states that both *thalassinus* and *simulatrix* will invade crop areas from fallow land and Hafez *et al.* (1963) describe experiments showing movement of *thalassinus* from *Cynodon* to irrigated areas for the higher relative humidity rather than for food preference, the female showing a better reaction to relative humidity than the male. Rungs (1938) describes *thalassinus* swarming in Morocco. Davey *et al.* (1959) suggest large scale migrations between seasonal habitats for *thalassinus* in Mali.

Phipps (1959 and 1966) discusses the biology of *thalassinus* (as *Aiolopus* sp.) and *longicornis* with special emphasis on egg production, and Robertson & Chapman (1962) give short biological notes on *longicornis*, *femoralis* and *thalassinus* in the Rukwa Valley.

Hafez *et al.* (1962), discussing the general ecology and biology of *thalassinus* in Egypt, showed the ability of both hoppers and adults to mature effectively on a variety of food crops and on *Cynodon* but found both cotton and lentil refused or detrimental to growth, and the same authors (Hafez *et al.*, 1963*a*) describe the possible humidity and temperature receptors in *thalassinus*.

Nolte (1939), discussing the colour forms and chromosome complex of *thalassinus* in Transvaal, considers this species a grassland type with two basic colour forms, green and light brown; the latter was by far the more common and the former was not controlled in colour by environment alone since most, but not all, specimens of it darkened to brown on maturity.

Very little is known of the natural enemies of *Aiolopus* spp., but the literature is reviewed by Greathead (1963) and the same author (1966) records *Blaesoxipha anceps* Vill. parasitizing *simulatrix* (as *savignyi*) in Eritrea. Chapman (1962) records rearing dipterous larvae from *Aiolopus* sp., Descamps & Wintrebert (1967) record *Scelio* sp. parasitizing eggs of *rodericensis* in Madagascar; and the present author can record *thalassinus* killed by *Entomophthora* sp. (probably *grylli*) in Rhodesia.

Of the published economic notes on the genus perhaps the most significant are those relating to *simulatrix*. Joyce (1952) gives an account of the damage caused by this species (as *savignyi*) to millet on a mechanized crop scheme in the Sudan. Coates (1893) records *Epacromia dorsalis* (Thunb.) and *E. tricoloripes* Burm. damaging various crops in many parts of India. The record of *tricoloripes* probably refers to *A. thalassinus tamulus* (Fabricius) and that of *dorsalis* refers to *simulatrix simulatrix* as the figure given, and copied by Fletcher (1914 : 525), is obviously of *simulatrix*. Coates (1893) records *simulatrix* (as *dorsalis*) causing serious damage to summer rain crops, particularly millet, in the Upper Sind Frontier district; and Barlow (1900) records *simulatrix* (as *dorsalis*) damaging young wheat seedlings in the Ahmednagar district of India.

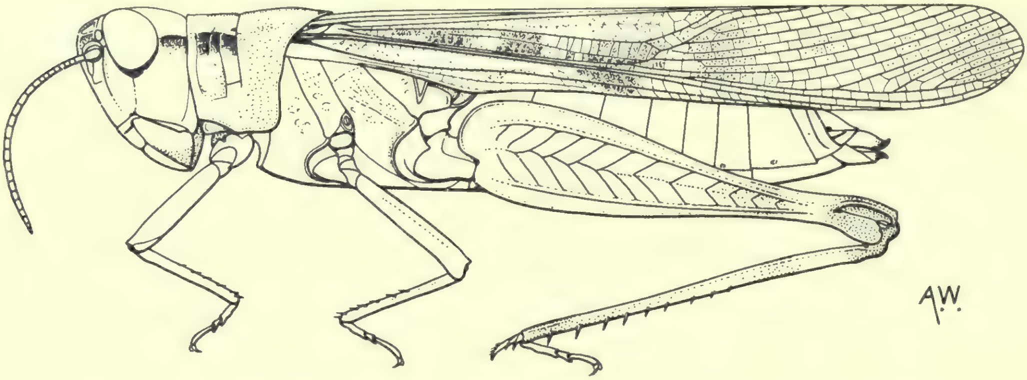


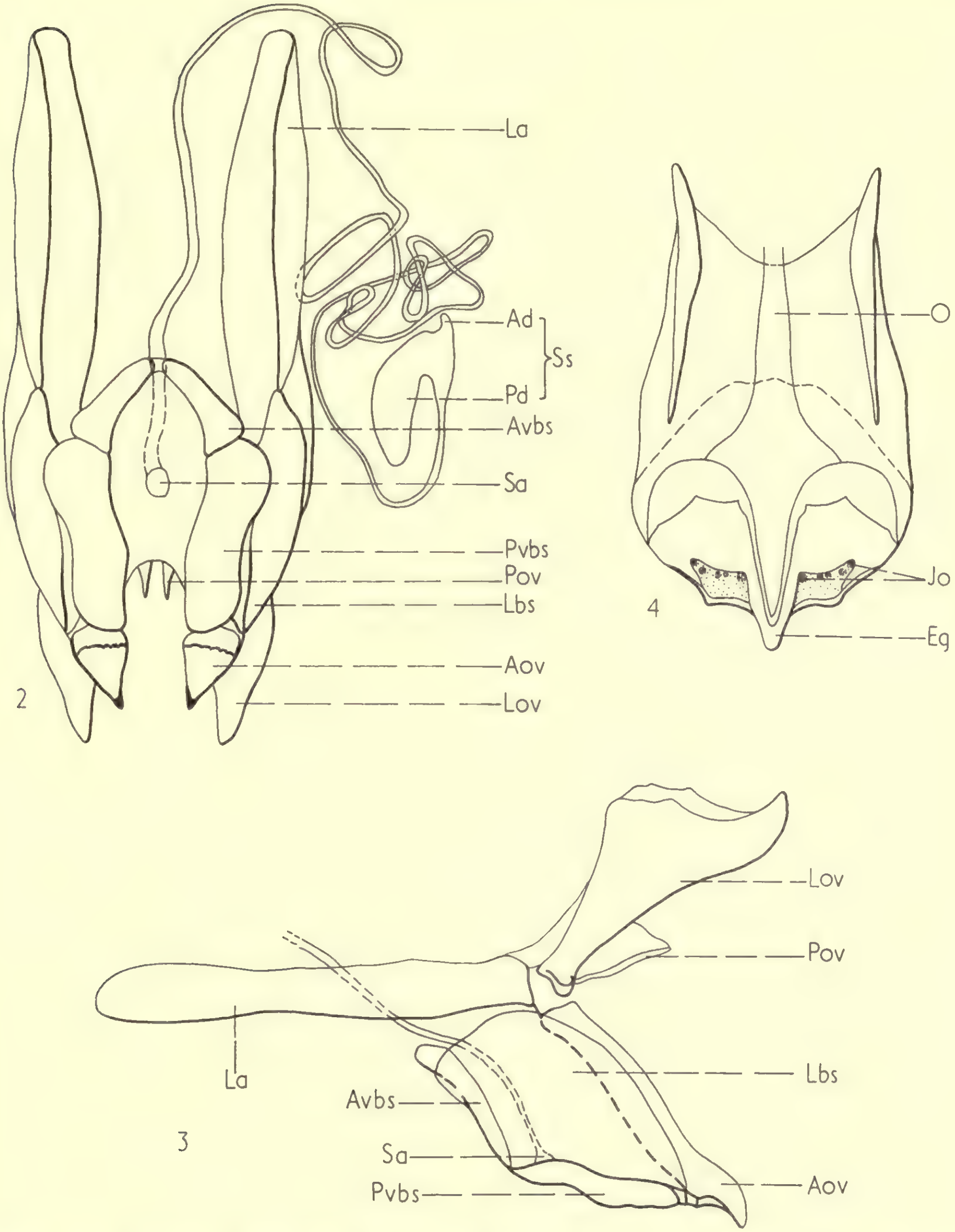
FIG. 1. *Aiolopus thalassinus thalassinus* (Fabr.). Entire insect, ♀, lateral view. (After Dirsh, 1965).

## TAXONOMIC TREATMENT

Until the present revision, the genus *Aiolopus* has never been considered in its entirety and earlier workers, e.g. Finot (1895 : 421), Brunner von Wattenwyl (1882 : 145), I. Bolivar (1898 : 69), Innes (1929 : 30) and Chopard (1943 : 287), were only concerned with separating species in particular areas. Consequently no set of characters has been tested for the genus as a whole.

Bei-Bienko (in Bei-Bienko & Mishchenko 1951 : 567) gives the most complete key to species previously published; in it five species are separated. He used a fairly large combination of characters, the genus being basically divided up on the width of the hind femur in relation to the width of the tegmen, coupled with the form of the pronotum. The present author has found the femoro-tegminal character unreliable as, for any species, the width of the tegmen varies directly with its length but by no means always directly with the width of the hind femur.

The width of the hind femur relative to its length can be used as a rough guide to species-groups, although there are overlaps between those with narrow hind femora, e.g. *A. thalassinus*, those with hind femora of medium thickness, e.g. *A. longicornis*,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FIGS. 2–4. *Aiolopus thalassinus thalassinus* (Fabr.) ♀ genitalia. 2, ovipositor, ventral view; 3, same, lateral view; 4, subgenital plate, dorsal view. Ad—apical diverticulum of spermatheca; Aov—anterior (ventral) ovipositor valve; Avbs—anterior ventral basivalvular sclerite; Eg—egg guide; Jo—Jannone's organs; La—lateral apodeme; Lbs—lateral apodeme; Lbs—lateral basivalvular sclerite; Lov—lateral (dorsal) ovipositor valve; O—oviduct; Pd—preapical diverticulum of spermatheca; Pov—posterior (inner) ovipositor valve; Pvbs—posterior ventral basivalvular sclerite; Sa—spermathecal aperture; Ss—spermathecal sac.

and the species with broad hind femora, e.g. *A. strepens*. However, when this character is coupled with other characters such as the form of the pronotum (Text-figs. 11–20), the frontal ridge (Text-figs. 21–29) and the length of the hind tibia relative to the hind femur (Text-figs. 5–8), the species are more clearly defined.

Identification of subspecies is more difficult as the characters are geographically significant trends such as the colouration of the hind tibia and the relative proportions of the hind femur and tegmen. The latter character is used to separate *A. thalassinus thalassinus* from *A. th. rodericensis* and *A. simulatrix simulatrix* from *A. s. femoralis* by comparison of the ratio of the length of the tegmen over the length of the pronotum (E/P) with the ratio of the length of the hind femur over its maximum width (FL/FW) (Text-figs. 37–38, 90–91).

The phallic complex appears to be of little use in separating species because, as in many other Acridinae genera, it is extremely similar in all the species and can only be used as a loose supporting indication of specific identity.

The female subgenital plate (Text-fig. 4) and ovipositor (Text-figs. 2–3) are very uniform within the genus and the spermatheca has a similar range of variation in most species.

## *AIOLOPUS* Fieber, 1853

*Aiolopus* Fieber, 1853 : 100.
*Epacromia* Fischer, 1853 : 360; Rehn, 1902 : 317.
*Aeolopus* [*sic*] Kirby, 1910 : 190.
*Aeoloptilus* Bei-Bienko, 1966 : 1793, **syn. n.**

Type-species: *Gryllus thalassinus* Fabricius, 1781; Kirby, 1910 : 190.

Medium size. Integument finely or moderately coarsely pitted. Antenna filiform, slightly shorter than, as long as, or longer than combined lengths of head and pronotum. Fastigium of vertex pentagonal, slightly longer than wide, moderately concave with well defined margins, forward angle acute or broadly rounded, fastigial foveolae trapezoid or rectangular, if former then narrowing forwards, shallow, normally with well defined margins; frons oblique; frontal ridge in some species slightly convex, in others flat or, sometimes weakly concave at and below median ocellus, if latter then marginal carinulae present but poorly developed. Eyes oval, long axis always vertical. Pronotum from slightly tectiform to slightly saddle-shaped, constricted at junction of prozona and metazona with former sometimes constricted medially; median carina linear, crossed only by posterior sulcus; raised lateral carinae absent in most species, rarely present in prozona, lateral " shoulders " often present; metazona longer than prozona, with obtuseangular posterior margin; mesosternal interspace as long as wide or slightly wider than long, rectangular or trapezoid and widening posteriorly. Tegmen and hind wings fully developed; intercalary vein of medial area of tegmen well developed and serrate at least in male, continuing to distal apex of medial area; membrane of tegmen semi-transparent with moderately sparse reticulation. Hind femur slender or broad, apical lobes rounded; hind tibia as long as or shorter than hind femur, apical spurs not specialized; arolium of medium size or small. Male supra-anal plate rounded-triangular, with moderately elongated, subangular posterior apex; cercus narrow-conical with subobtuse apex; subgenital plate short, subconical, with rounded apex; epiphallus with moderately narrow bridge, curved ancorae and bilobed lophi; ectophallic membrane sclerotized and forming sheath below apical penis valves; cingulum with horseshoe-shaped arch bearing moderately long apodemes and very weak or more strongly developed dorsal processes, from ramus lateral processes extend backwards on each side above cingular valves, latter crescent-shaped in profile and slightly expanded medially; cingular valves less sclerotized than apical penis valves, elipsoid in profile, with acute apices; basal penis valves with moderately or well developed lateral expansions which are rarely recurved; flexure narrow; apical penis valves very narrow-triangular in profile, with acute apices. Ovipositor of female short; valves moderately robust, with curved apices, lower valve with small externo-ventral tooth; spermatheca with sac-like preapical and short finger-like apical diverticula.

When this genus was first erected by Fieber as *Aiolopus* and later by Fischer as *Epacromia* neither author designated a type-species but both gave a list of contained species for their genera. Kirby (1910) designated *Gryllus thalassinus* Fabricius as the type-species for the genus *Aiolopus* after Rehn's (1902) synonymy of Fieber's and Fischer's genera. As *G. thalassinus* was listed by both Fieber and Fischer in their genera, Rehn's synonymy can be accepted.

Bei-Bienko (1966) erected the genus *Aeoloptilus* for a new species *carinatus* Bei-Bienko (1966), described from Komodo Island. The present author has been able to examine male and female paratypes of this species and a female specimen from Sumba Island. Bei-Bienko separates *Aeoloptilus carinatus* from *Aiolopus* by the presence of lateral pronotal carinae, the weak and elongate-oval fastigial foveolae and the shape of the intercalary vein of the medial area of the tegmen. As will be seen below, lateral pronotal carinae are not good diagnostic features in *Aiolopus*, as they may or may not be very weakly developed in *A. thalassinus tamulus* (Fabricius). The fastigial foveolae in *carinatus* appear to be of the *Aiolopus* type but weakly developed. The intercalary vein of the medial area of the tegmen in *carinatus* shows no significant difference in shape or position from that of *A. thalassinus* (Fabricius). Furthermore the male phallic complex of *carinatus* is extremely similar to that of *A. th. tamulus* (Fabricius). For these reasons the genus *Aeoloptilus* Bei-Bienko is synonymized with *Aiolopus*, but the type-species, *carinatus*, is kept distinct for reasons discussed below (p. 334).

*Aiolopus* is placed naturally in the oedipodine half of the subfamily Acridinae where it may be distinguished by the following combination of characters: filiform antenna, trapezoid or rectangular fastigial foveolae, weakly tectiform or saddle-shaped dorsum of pronotum, lateral pronotal carinae absent or weakly present only in prozona, metazona of pronotum longer than prozona and its posterior margin obtuseangular, mesosternal interspace as wide as or wider than long, intercalary vein of medial area of tegmen extending to distal apex of medial area, hind femur with lower outer area not expanded, hind tibia not expanded and its apical spurs not specialized, epiphallus with simple bilobed lophi, male subgenital plate subconical, and apical penis valves short.

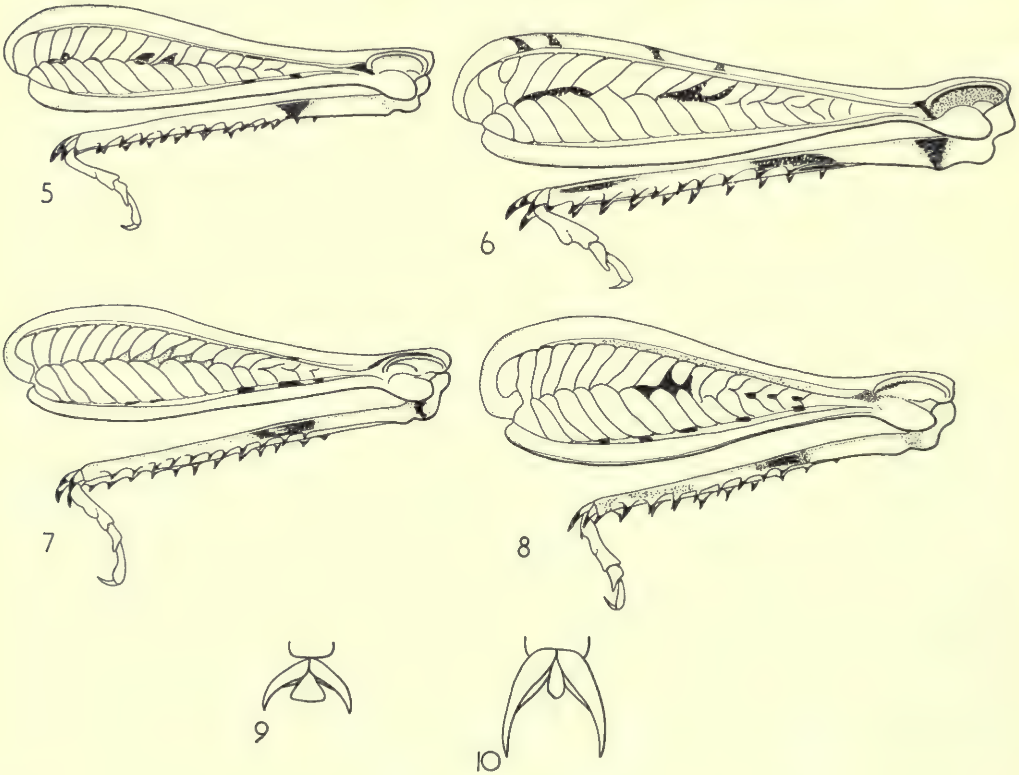
The genus is widely distributed throughout the Old World south of latitude 50° N. and north of latitude 40° S., extending westwards to the Cape Verde Islands and eastwards to the Samoan Islands. Its distribution in the Indian Ocean region is of particular interest. Two species are present, *A. thalassinus* and *A. simulatrix*, both on the east coast of Africa and the west coast of India, but *thalassinus* is not found east of the Seychelles Islands and *simulatrix* is not found west of Coetivy Island. This possibly suggests invasion of the region by the genus during different geological times.

## KEY TO SPECIES AND SUBSPECIES

1 Hind tibia considerably shorter than hind femur, with a maximum of nine outer and ten inner spines (Text-fig. 8); frontal ridge coarsely and densely pitted, without lateral carinulae, with margins converging strongly just below fastigium (Text-fig. 27); prozona of pronotum gradually sloping away on each side of median carina and without trace of lateral " shoulders " (Text-figs. 15–16); hind femur broad or very broad . . . . . . . . . . . . . . . 2

– Hind tibia as long as or only slightly shorter than hind femur, with at least nine to twelve outer and ten to thirteen inner spines (Text-figs. 5–7); frontal ridge more sparsely pitted, if coarsely pitted then not narrowing strongly just below fastigium (Text-figs. 21–26, 28–29); pronotum almost flat or slightly saddle-shaped, prozona either with pattern suggesting presence of lateral carinae or almost flat dorsally and without median constriction (Text-figs. 11–14, 17–20); hind femur narrow or broad . . . . . . . . . . . . . . . 3

2 Hind femur very broad, ratio of length to width (FL/FW) barely 3·0; tegmen hardly surpassing tip of hind femur, ratio of length of tegmen over length of pronotum (E/P) normally between 3·7 and 4·5. S.W. Tanzania, Zambia and South Africa **simulatrix femoralis** Uvarov (p. 325)

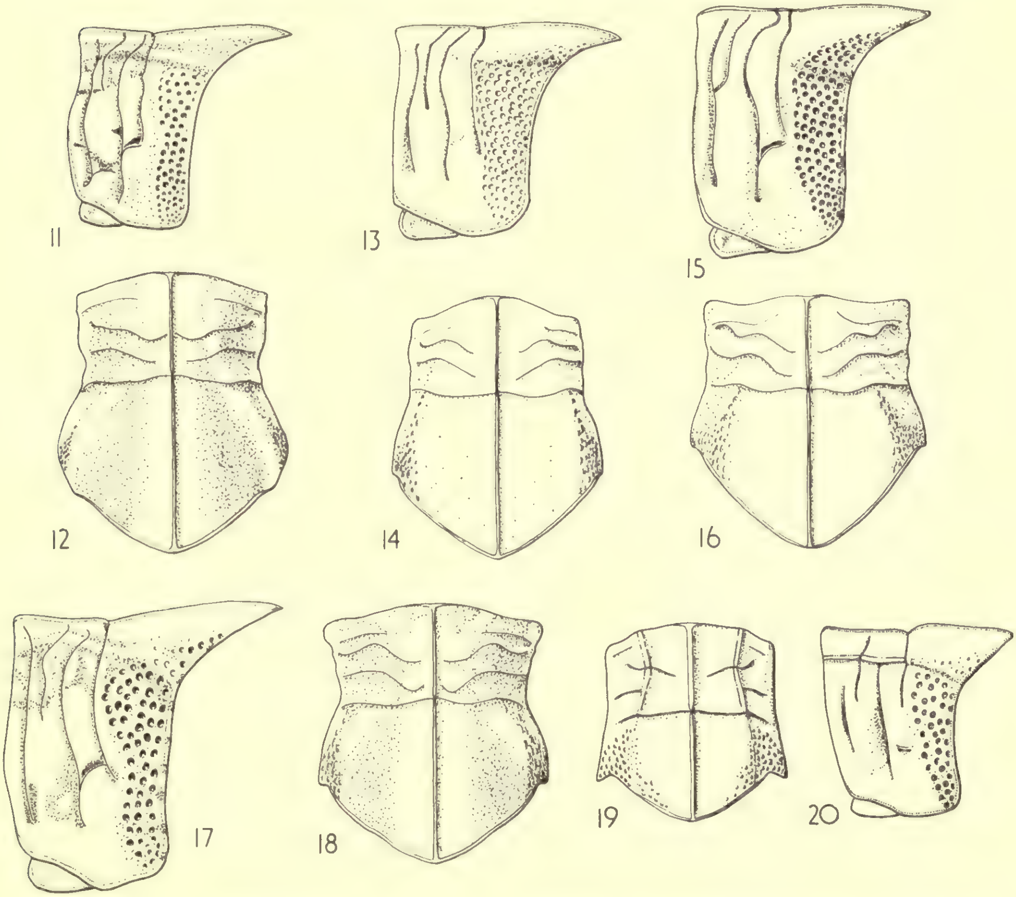


FIGS. 5–10. *Aiolopus* spp. 5–8 hind femora, lateral view: 5, *A. thalassinus thalassinus* (Fabr); 6, *A. longicornis* Sjöst.; 7, *A. strepens* (Latr.); 8, *A. simulatrix simulatrix* (Walker); 9 and 10, pulvillus and claw of hind tarsus, ventral view: 9, *A. thalassinus thalassinus* (Fabr.); 10, *A. oxianus* Uv.

– Hind femur slightly less broad, ratio of length to width (FL/FW) about 3·4; tegmen well surpassing tip of hind femur, ratio of length of tegmen over length of pronotum (E/P) normally between 4·5 and 5·3. Northwards from E. Tanzania to eastern Mediterranan region, Arabian peninsula, Middle East, India, Burma, Islands of Indian Ocean westwards to Seychelles. . . ***simulatrix simulatrix*** (Walker) (p. 320)

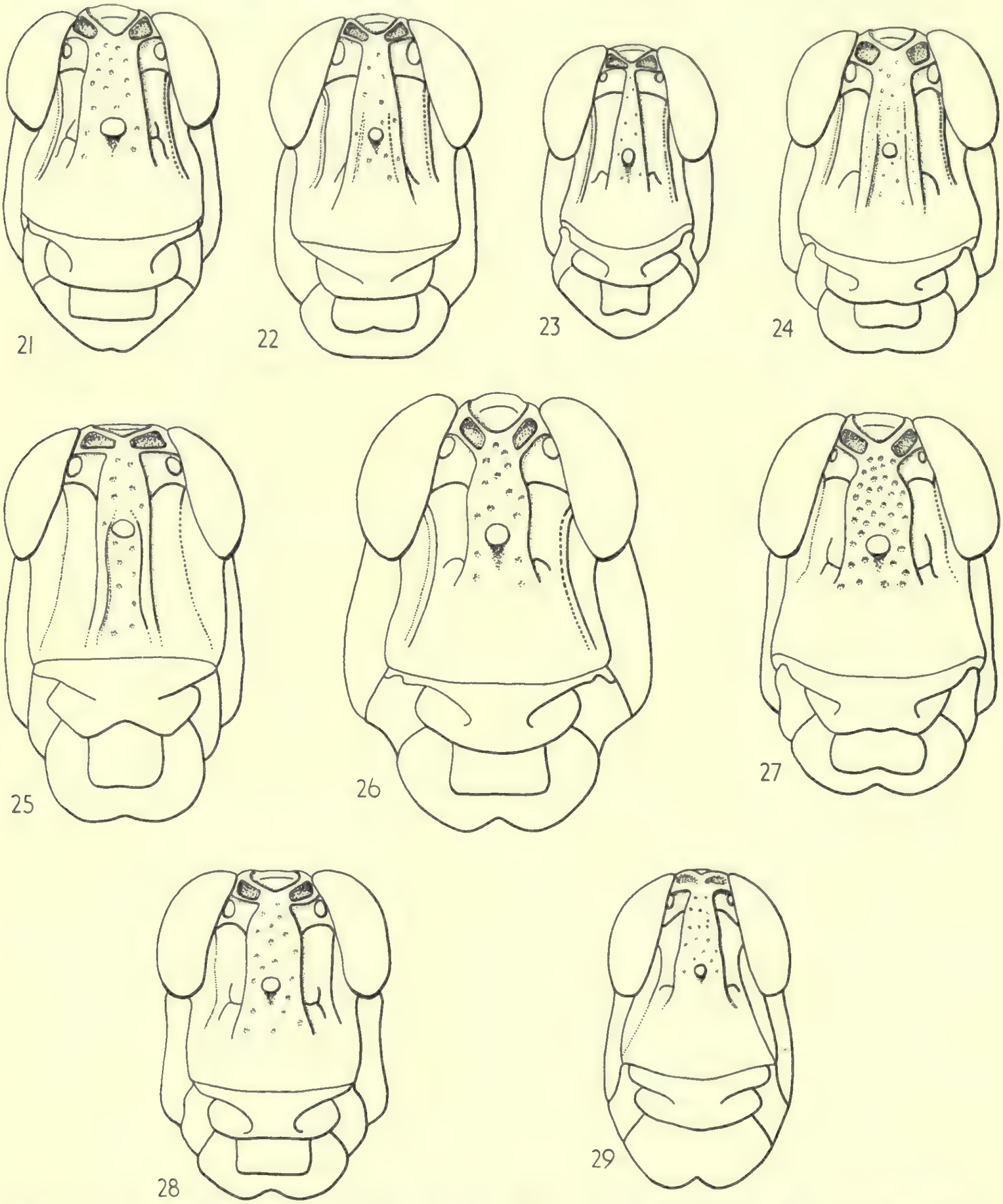
3 Pronotum almost flat dorsally and without constriction in prozona (Text-figs. 13–14); hind femur broad, ratio of length to width (FL/FW) about 3·4 (Text-fig. 7); hind tibia with ten outer and eleven inner spines, red except for basal quarter; maximum width of face (C) normally less than maximum width of hind femur (FW); antennae shorter than combined lengths of head and pronotum. Southern Palaearctic region westwards to Persian Gulf. . . . . . ***strepens*** (Latreille) (p. 327)

– Pronotum slightly saddle-shaped and with median prozonal constriction (Text-figs. 11–12, 17–20); hind femur narrow or broad, if latter then only with nine outer



Figs. 11–20. *Aiolopus* spp., pronota. 11, *A. thalassinus thalassinus* (Fabr.), lateral view; 12, same, dorsal view; 13, *A. strepens* (Latr.), lateral view; 14. same, dorsal view; 15, *A. simulatrix simulatrix* (Walker), lateral view; 16, same, dorsal view; 17, *A. longicornis* Sjöst., lateral view; 18, same, dorsal view; 19, *A. carinatus* (Bei-Bienko), dorsal view; 20, same, lateral view.

and ten inner spines (Text-figs. 5–6); maximum width of face (C) normally greater than maximum width of hind femur (FW); antennae at least as long as combined lengths of head and pronotum . . . . . . . . . . 4



FIGS. 21–29. *Aiolopus* spp., heads, anterior view. 21, *A. thalassinus thalassinus* (Fabr.), ♀; 22, *A. thalassinus tamulus* (Fabr.), ♀; 23, *A. thalassinus tamulus* (Fabr.), ♂ from Christmas Island; 24, *A. thalassinus dubius* (Willemse), ♀; 25, *A. oxianus* Uv., ♀; 26, *A. longicornis* Sjöst., ♀; 27, *A. simulatrix simulatrix* (Walker), ♀; 28, *A. strepens* (Latr.), ♀; 29, *A. carinatus* (Bei-Bienko), ♀.

4 Arolium of hind tarsus very small, about one quarter the length of claw (Text-fig. 10); frontal ridge weakly sulcate and with parallel, obtuse, lateral carinulae which extend almost to base of frons (Text-fig. 25). Central Asia **oxianus** Uvarov (p. 330)

– Arolium of hind tarsus larger, about half length of claw (Text-fig. 9); frontal ridge normally flat, if sulcate then lateral carinulae gradually converging upwards (Text-figs. 21–24, 29) . . . . . . . . . . . . . . 5

5 Fastigial foveolae weak, ovoid, with poorly developed margins (Text-fig. 29); prozona of pronotum with lateral carinae moderately developed, parallel or weakly diverging anteriorly (Text-figs. 19–20); hind tibia with twelve outer and twelve or thirteen inner spines. Komodo and Sumba Islands. **carinatus** (Bei-Bienko) (p. 332)

– Fastigial foveolae rectangular or trapezoid, with well developed margins (Text-figs. 21–24); prozona of pronotum with lateral carinae absent or very weakly developed (Text-figs. 11–12); hind tibia with nine or ten outer and ten or eleven inner spines 6

6 Antennae very long, when extended backwards almost reaching base of hind femur; face broad (Text-fig. 26), ratio of length of pronotum over maximum width of head (P/C) about 1·05; large species with very prominent criss-cross pattern on dorsum of pronotum (Text-figs. 17–18); hind femur of medium thickness. East Africa, Lake Chad . . . . . . . **longicornis** Sjöstedt (p. 334)

– Antennae not longer than combined lengths of head and pronotum; face narrower, ratio of length of pronotum to maximum width of head (P/C) about 1·20 but if much less then pronotum short and broad and fastigial foveolae not much longer than wide . . . . . . . . . . . . . . . 7

7 Fastigial foveolae broadly trapezoid, hardly one and a half times longer than wide; hind tibia not black ventrally; pronotum short and broad; hind femur broad, ratio of length to width (FL/FW) less than 3·7. East and southern Africa **meruensis** Sjöstedt (p. 336)

– Fastigial foveolae narrowly trapezoid, about twice as long as broad, but if less then hind tibia bluish in apical two thirds or almost completely black ventrally; pronotum narrower; hind femur of medium thickness or narrow, ratio of length to width (FL/FW) more than 3·5 . . . . . . . . . . 8

8 Ventral surface of hind tibia completely black or dark brown in apical three quarters; fastigial foveolae rectangular and about one and a half times longer than wide (Text-fig. 24). Polynesia eastwards to Samoa . . **thalassinus dubius** (Willemse) (p. 351)

– Ventral surface of hind tibia with dark colouration, if present, broadly interrupted with reddish, bluish or ochraceous band; fastigial foveolae narrowly trapezoid, about twice as long as wide (Text-figs. 21–23) . . . . . . . . 9

9 Hind femur of medium thickness, ratio of length to width (FL/FW) between 3·4 and 4·0; tegmen shorter, ratio of length of tegmen over length of pronotum (E/P) between 4·1 and 4·9; hind tibia without red colouration Madagascan subregion west of Comoro Islands. . . **thalassinus rodericensis** (Butler) (p. 343)

– Hind femur narrower, ratio of length to width 4·0 or more; tegmen longer, ratio of length of tegmen over length of pronotum (E/P) 4·7–5·5. Palaearctic, Ethiopian and Oriental regions . . . . . . . . . . . . . 10

10 Frontal ridge narrow, gradually and continuously narrowing upwards (Text-figs. 22–23); hind tibia with red colouration, if present, broadly separated from basal black band by bluish grey band. East India and Ceylon eastwards to Australia. **thalassinus tamulus** (Fabricius) (p. 347)

– Frontal ridge broad, with lateral margins only slightly convergent upwards to fastigium (Text-fig. 21); hind tibia with apical red colouration, if present, narrowly separated from basal black band by ochraceous band. Ethiopian region, N. and W. India westwards to Palaearctic region. **thalassinus thalassinus** (Fabricius) (p. 340)

## ***Aiolopus simulatrix*** (Walker, 1870)

This species is divided into two subspecies which are described and discussed below.

### ***Aiolopus simulatrix simulatrix*** (Walker, 1870) **stat. n.**

(Text-figs. 8, 15, 16, 27, 30–39)

*Epacromia simulatrix* Walker, 1870 : 773.
*Heteropternis* (?) *savignyi* Krauss, 1890 : 262, **syn. n.**
*Epacromia affinis* I. Bolivar, 1902 : 600, **syn. n.**
*Acrotylus simulatrix* (Walker, 1870) Kirby, 1910 : 267.
*Aeolopus laticosta* I. Bolivar, 1912 : 270, **syn. n.**
*Aeolopus strepens deserticola* Uvarov, 1922 : 358, **syn. n.**

Type locality. South Hindustan; type ♂ deposited in the BM(NH).

*Redescription.* ♂. Integument more strongly rugulose than the other species in the genus. Antenna as long as combined lengths of head and pronotum with twenty-two to twenty-four segments. Fastigium of vertex pentagonal, slightly longer than wide, moderately concave with well defined margins, forward angle narrowly rounded; fastigial foveolae rectangular, shallow, coarsely pitted, with moderately well defined margins, lower margin often very weak; frontal ridge wide, coarsely and densely pitted (Text-fig. 27), with parallel margins along most of length but narrowing strongly just below fastigium. Eye oval, about one and a half times as high as wide and almost twice as high as length of subocular groove. Pronotum relatively narrow (Text-figs. 15–16); prozona cylindrical above, with very slight median constriction; metazona rather flat, with obtuse angular posterior margin; median longitudinal carina stronger in prozona than in metazona; lateral plate of pronotum higher than wide; mesosternal interspace wider than long, trapezoid, slightly widening posteriorly. Tegmen relatively long, E/P ratio about 4·9. Hind femur broad, ratio of length to width about 3·5; hind tibia shorter than hind femur (Text-fig. 8), with nine outer and ten inner spines, inner apical spurs slightly less than twice as long as outer pair; arolium almost half length of claw. Phallic complex (Text-figs. 30–33) with zygoma of cingulum with small dorsal processes and short apodemes; basal valves of penis with small lateral expansions which are not recurved posteriorly.

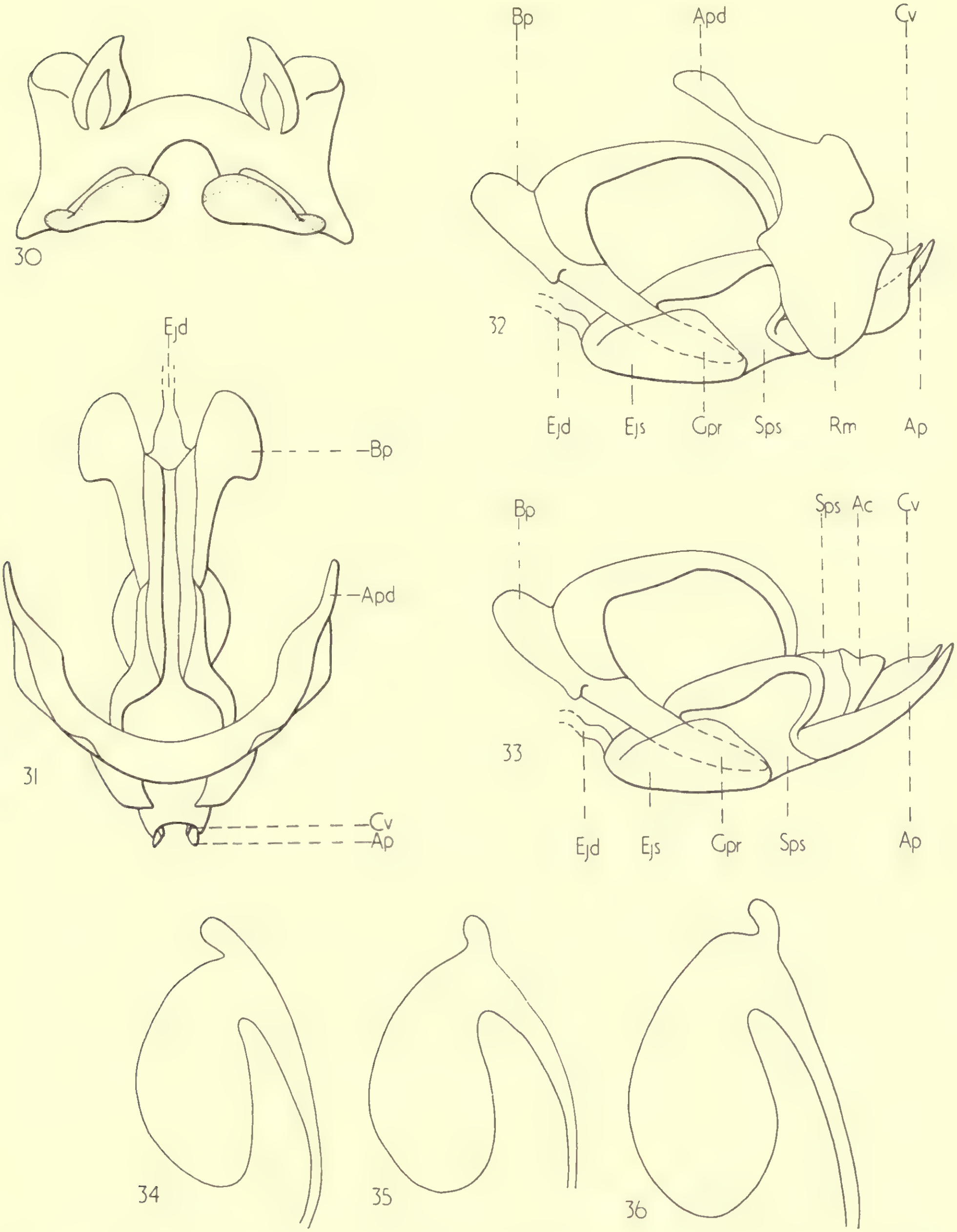
General colouration mid-brown with ochraceous (or green) and blackish markings; pronotum often unicolorously brown or rarely greenish, sometimes with weak ochraceous X-shaped pattern on dorsum; tegmen with two ochraceous transverse fasciae which extend from anterior margin to first vannal vein (Snodgrass, 1935), the proximal fascia narrows somewhat posteriorly, apex of tegmen mottled; hind wing hyaline, sometimes pale yellow basally, apex slightly darkened; hind femur with two dark spots in upper outer area, inner surface ochraceous with two incomplete dark fasciae, lower inner area often reddish, hind " knee " blackish; hind tibia narrowly black basally, followed by broad ochraceous ring and with broad blackish or grey ring medially, apical third reddish or ochraceous.

♀. Larger and more robust than male. Spermatheca as in Text-figs. 34–36.

Measurements (mm.). Length of body, ♂ 16·9–26·0, ♀ 21·0–30·8. Length of pronotum. ♂ 3·2–4·5, ♀ 3·9–5·2. Length of tegmen, ♂ 16·1–21·9, ♀ 18·5–26·6. Length of hind femur, ♂ 9·5–14·5, ♀ 11·0–14·6. Maximum width of hind femur, ♂ 2·7–4·3, ♀ 3·3–4·6. Maximum width of head (C), ♂ 2·9–4·1, ♀ 3·6–5·0.

Ratios (forty males and forty females measured):

| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 1·00 | 1·11 | 1·20 | 3·27 | 3·48 | 3·65 | 4·75 | 4·93 | 5·34 | 1·54 | 1·69 | 1·87 |
| ♀ | 1·00 | 1·09 | 1·21 | 3·13 | 3·43 | 3·78 | 4·46 | 4·93 | 5·31 | 1·54 | 1·72 | 1·82 |


30
Bp
Apd
Cv
32
Ejd
Ejs
Gpr
Sps
Rm
Ap
Ejd
Bp
Apd
31
Cv
Ap
Bp
Sps
Ac
Cv
33
Ejd
Ejs
Gpr
Sps
Ap
34
35
36

FIGS. 30–36. *A. simulatrix simulatrix* (Walker), genitalia. 30, ♂ epiphallus; 31, ♂ phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 32, same, lateral view; 33, ♂ endophallus, lateral view; 34, ♀ spermatheca of specimen from Tanzania; 35, same, from Jordan; 36, same, from S. India.

Discussion. This subspecies is quite variable in size, general colouration, relative width of hind femur and relative length of tegmen. The last two characters show a very general tendency to vary according to geographical distribution, the trends being towards slightly broader hind femora and shorter tegmina as the species extends southwards down the eastern half of the African continent and narrower hind femora and longer tegmina as the species extends southwards down the Indian peninsula. The former trend reaches its culmination in southern Africa, and the forms involved in it are here regarded as a separate subspecies *A. simulatrix femoralis* Uvarov; the latter trend culminates in populations on the Maldive, Chagos and Seychelles Islands. By comparing the ratios of length to width of the hind femur against the ratio of the length of the tegmen over the length of the pronotum these trends may be demonstrated, as in Text-figs. 37–38.

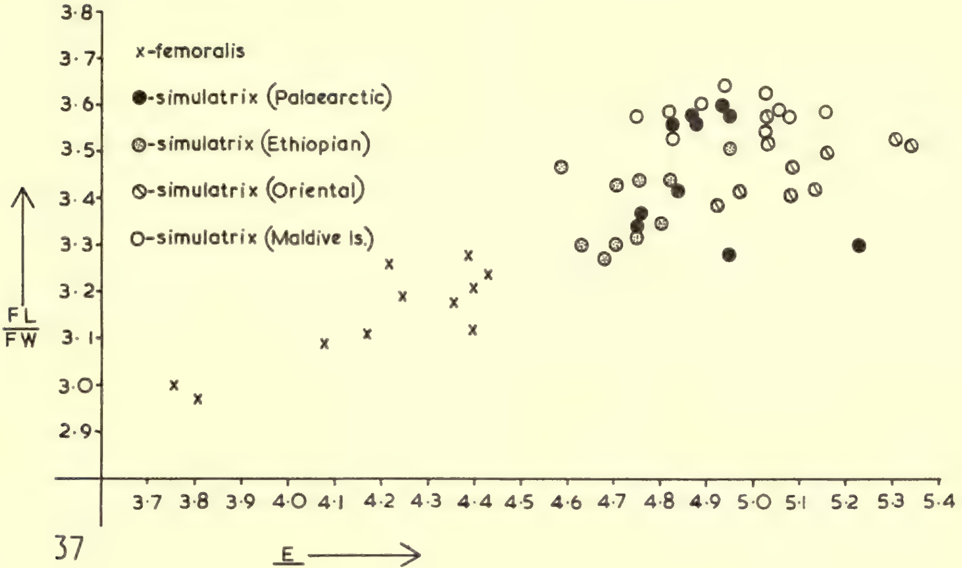
*A. simulatrix simulatrix* may be readily distinguished from other species in the genus by the form of the frontal ridge, pronotum and hind leg.

Up to the present this species has been recorded in the literature as *A. savignyi* (Krauss), the type of which species does not exist and is known only as a drawing in Savigny's " Descriptions de l'Egypt " (1809–1813 : 182, pl. 6, fig. 16), from which a specific description was made by Krauss (1890 : 262) as *Heteropternis* (?) *savignyi*. The original drawing is not particularly diagnostic and as the specimen from which the drawing was made is no longer in existence, the true identity of the name *savignyi* is open to subjective conclusions. Storey (1919 : 55) synonymized *H. savignyi* with *Epacromia strepens* (Latreille) but in all probability Storey's *E. strepens* was the same species as *A. savignyi* of other authors. Uvarov (1942 : 337) firmly established the synonymy of *H.* (?) *savignyi* with *Epacromia affinis* I. Bolivar (1902) and *A. strepens affinis* Uvarov (1924 : 21). In order not to confuse the literature even further the present author accepts Uvarov's interpretation of Savigny's drawing as being the species which has, up to the present, been named *A. savignyi* (Krauss).

However the type male of *Epacromia simulatrix* Walker, 1870 represents the same species and therefore Krauss's name should fall into synonymy. The use of the older Walker name is a strict application of the law of priority but does involve the use of a *nomen oblitum*, as it has not been used as a senior synonym in the primary zoological literature since its original publication in 1870; it has been used, in the present author's opinion quite wrongly, as a junior synonym by Kirby (1914 : 122) and I. Bolivar (1918 : 382). The usage of Walker's name is proposed for the two following reasons: firstly, the name in common usage, i.e. *savignyi* Krauss, is based upon the description of a drawing of a specimen which is now lost and which is therefore open to subjective interpretation; and secondly, the older *nomen oblitum* i.e. *simulatrix* Walker, is based upon the description of an objective type specimen which is still in existence.

*Aeolopus strepens deserticola* Uvarov is synonymized here, since the male upon which Uvarov based the subspecies falls well within the range of individual variation of the nominate subspecies. The type male bears the locality label "KAZVIN, N.W. Iran " and is deposited in the BM(NH).

*Aeolopus laticosta* I. Bolivar, described from the Chagos Islands in the Indian Ocean, represents an extreme form of the nominate subspecies which, however, cannot be



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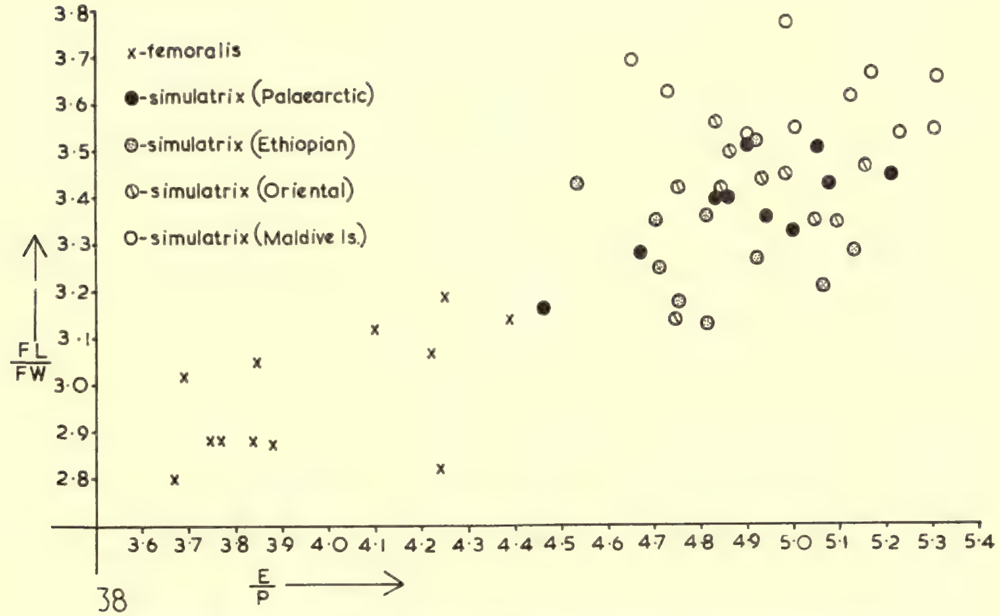

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FIGS. 37, 38. *A. simulatrix* subspp., scatter diagrams comparing values of FL/FW against E/P. 37, males; 38, females.

regarded as distinct as it merges very well with the more typical form on the Indian mainland through populations on the Maldive and Laccadive Islands. The lectotype male, bearing the locality label " Diego Garcia, Chagos Is. ", was selected by Dirsh (1963) and is deposited in BM(NH).

*Epacromia affinis* I. Bolivar was described from a male and female from South India. The male is here selected as LECTOTYPE and bears the following data: " Madure, P. Pantel, *E. affinis* "; it is deposited in Madrid.

Distribution (Text-fig. 39). From the seven hundred and thirty-nine specimens of this subspecies examined the following distributional conclusions are made:

TANZANIA, March to April, July, December to January; KENYA, January to June; SOMALIA, June to August, October to November, January; FRENCH SOMALILAND, August; ETHIOPIA, February to April, July, November to December; SUDAN, May

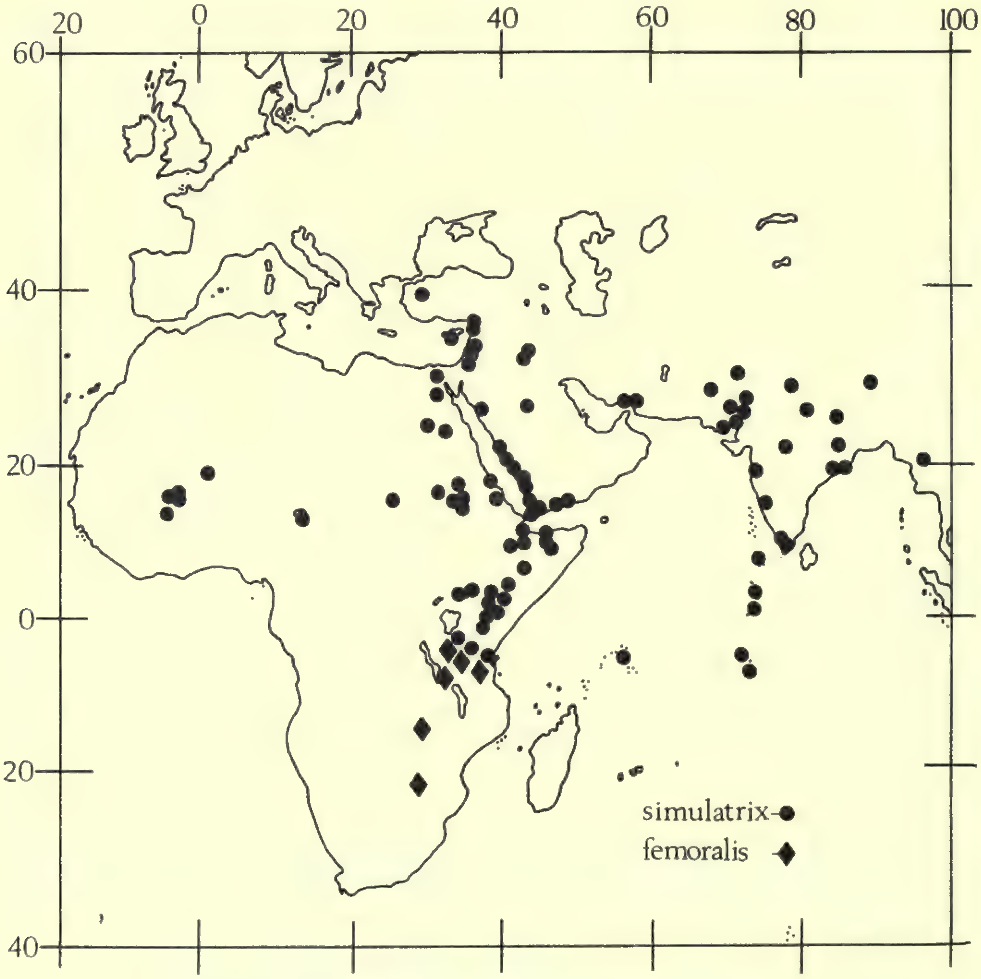


FIG. 39. *A. simulatrix* subspp., distribution map.

through to January; Nigeria, May, July to August, October; Senegal, August to September; Mali, June, August to December, March; United Arab Republic, May, August to September; Southern Yemen, June, August to November; Yemen, March, June to July, December; Saudi Arabia, August through to June; Israel, June, August, October to November; Jordan, March, May, June, October; Syria, August; Turkey, November; Cyprus, May, July, September; Iraq, May to September, December; Iran, April to June; West Pakistan, July, September, November; India, June to November, March to April; Burma, October; Laccadive Is., No dates; Maldive Is., July to August, October, December to February; Chagos Is., May to December; Seychelles, Coetivy, May to December.

## ***Aiolopus simulatrix femoralis*** Uvarov, 1953 **stat. n.**

(Text-figs. 37–45)

*Aiolopus femoralis* Uvarov, 1953 : 109, figs. 126–128.

Type locality. Northern Rhodesia: Luano Valley, Chisorwe; type ♂ deposited in the BM(NH).

Differs from the nominate subspecies in the following ways:

♂. Smaller size; tegmen shorter, hardly reaching or just exceeding tip of hind femur, E/P ratio about 4·0; hind femur very broad, about three times longer than maximum width or even broader; hind tibia with normally eight or rarely nine inner and normally nine or rarely ten outer spines; phallic complex (Text-figs. 40–43) very similar to nominate subspecies, but dorsal processes on zygoma of cingulum a little larger and apodemes a little longer, and lateral expansions of basal valves of penis larger and slightly recurved.

♀. Spermatheca as in Text-figs. 44–45.

Measurements (mm.). Length of body, ♂ 16·8–19·9, ♀ 21·3–25·5. Length of pronotum, ♂ 3·6–4·1, ♀ 4·3–5·0. Length of tegmen, ♂ 14·1–17·0, ♀ 15·8–20·2. Length of hind femur, ♂ 9·5–11·4, ♀ 10·9–13·8. Maximum width of hind femur, ♂ 3·1–3·6, ♀ 3·8–4·4. Maximum width of head, ♂ 3·1–3·7, ♀ 4·0–4·6.

Ratios (twelve males and twelve females measured):

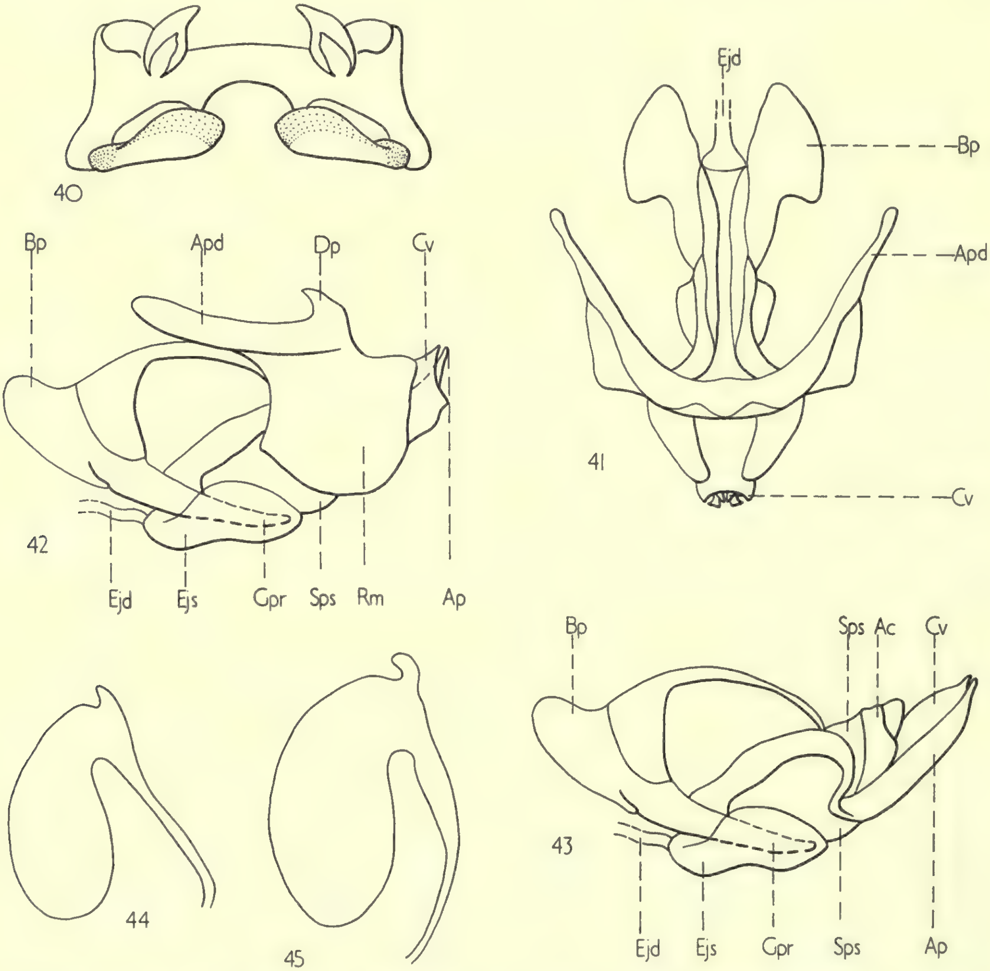
| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 1·08 | 1·14 | 1·18 | 2·97 | 3·15 | 3·28 | 3·76 | 4·18 | 4·43 | 1·42 | 1·51 | 1·58 |
| ♀ | 1·00 | 1·06 | 1·14 | 2·80 | 2·98 | 3·19 | 3·67 | 3·97 | 4·39 | 1·37 | 1·47 | 1·58 |

Discussion. Only a small number of specimens of this subspecies have been examined and variation appears chiefly in size and general colouration. There is a general tendency as the subspecies extends southwards for the hind femur to become relatively thicker and for the number of spines on the hind tibia to decrease from nine outer and ten inner to eight outer and nine inner.

When first described, *femoralis* was considered to be a distinct species and by its broad hind femora and short tegmina the type series would appear to be fairly well distinguished from *simulatrix*. However, specimens from southern Tanzania are less well defined and the specimen examined from South Africa is even more clearly defined than the type series, suggesting a culmination of trends which can be seen in *simulatrix* as it extends southwards down E. Africa. The line of demarkation between the two subspecies in Tanzania coincides fairly well with that between the wooded steppe of the Sudan and of E. Africa and the savanna of south-eastern Africa (see Keay, 1959).

Distribution (Text-fig. 39) (thirteen males and twelve females examined). TANZANIA: Kimamba, iv, 1 ♂; Tumba, i, 2 ♂, 1 ♀; ii, 5 ♂; xii, 1 ♂; Lake Rukwa, v, 1 ♀; C. Rukwa, Lundi Mbuga, xii, 4 ♀; Mshughaa, 35 mls, S.E. of Singida, xii, 1 ♂.

ZAMBIA: Luano Valley, Chisorwe, ii, 3 ♂, 3 ♀; iii, 2 ♀.



FIGS. 40–45. *A. simulatrix femoralis* Uv., genitalia. 40, ♂ epiphallus; 41, ♂ phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 42, same, lateral view; 43, ♂ endophallus, lateral view; 44, ♀ spermatheca of specimen from Zambia; 45, same, from Tanzania.

SOUTH AFRICA: Transvaal, Zoutpansberg distr., Limpopo R., nr. Kobeenpan, 2,200 ft., iv, " along banks ", 1 ♀.

### ***Aiolopus strepens*** (Latreille, 1804)

(Text-figs. 7, 13, 14, 28, 46–51)

*Acrydium strepens* Latreille, 1804 : 154.
*Gryllus prasinus* Thunberg, 1815 : 239, **syn. n.**
*Acridium vittatum* Brullé, 1840 : 78, pl. 5, fig. 7; Finot, 1895 : 422.

Type locality. " Environs de Bordeaux "; specimen lost. NEOTYPE (♀) erected bearing the following data: FRANCE: Dordogne, les Eyzies, ix. 1949 (ex. Zeuner coll. ), B.M. 1964–194. This specimen was chosen because of its agreement with Latreille's original description and the close proximity of its locality to the original type locality; it is deposited in the BM(NH).

*Redescription.* ♂. Robust body-form, integument moderately rugulose. Antenna shorter than combined lengths of head and pronotum. Fastigium of vertex pentagonal with forward angle broadly rounded, hardly longer than wide, shallowly concave; fastigial foveolae trapezoid, narrowing forwards, very shallow with lower margin somewhat obliterated, about one and three quarter times as long as maximum width; frontal ridge flat or convex, sparsely pitted, gradually narrowing upwards (Text-fig. 28). Eye ellipsoid, almost twice as high as maximum width and about one and three quarter times as high as length of subocular groove. Dorsum of pronotum subtectiform, rather flat, prozona not constricted medially (Text-fig. 13–14); metazona almost one and three quarter times as long as length of prozona, with narrowly obtuseangular posterior margin; lateral plate of pronotum higher than wide; mesosternal interspace rectangular, slightly broader than long. Tegmen short and broad, normally only slightly exceeding tip of hind femur. Hind femur broad, about 3·3 times as long as maximum width and always broader than maximum width of head; hind tibia as long as hind femur (Text-fig. 7), with ten outer and normally eleven inner spines; inner apical spurs slightly more than one and a half times as long as outer pair; arolium about half length of claw. Supra-anal plate, cercus and subgenital plate normal for genus. Phallic complex (Text-figs. 46–49) with zygoma of cingulum without dorsal processes but expanded laterally at bases of apodemes; basal valves of penis expanded laterally but not recurved.

General colouration from uniformly brown through brown and ochraceous or green to uniformly green; dorsum of pronotum normally unicolourous but sometimes with median longitudinal contrasting stripe which may continue forwards along vertex; tegmen with pale basal transverse fascia which extends either as far across as medial vein or as far as 1st vannal vein in which case it narrows strongly posteriorly, median pale transverse fascia always extending broadly or narrowly to 1st vannal vein; hind wing hyaline, often bluish basally, apex darkened; hind femur apically with inner area black and upper outer area blackish, lower inner area reddish; hind tibia narrowly black basally, basal quarter ochraceous or pinkish, apical three quarters red, the two colours separated by a narrow and incomplete black band.

♀. As male but larger and more robust; spermatheca as in Text-fig. 50.

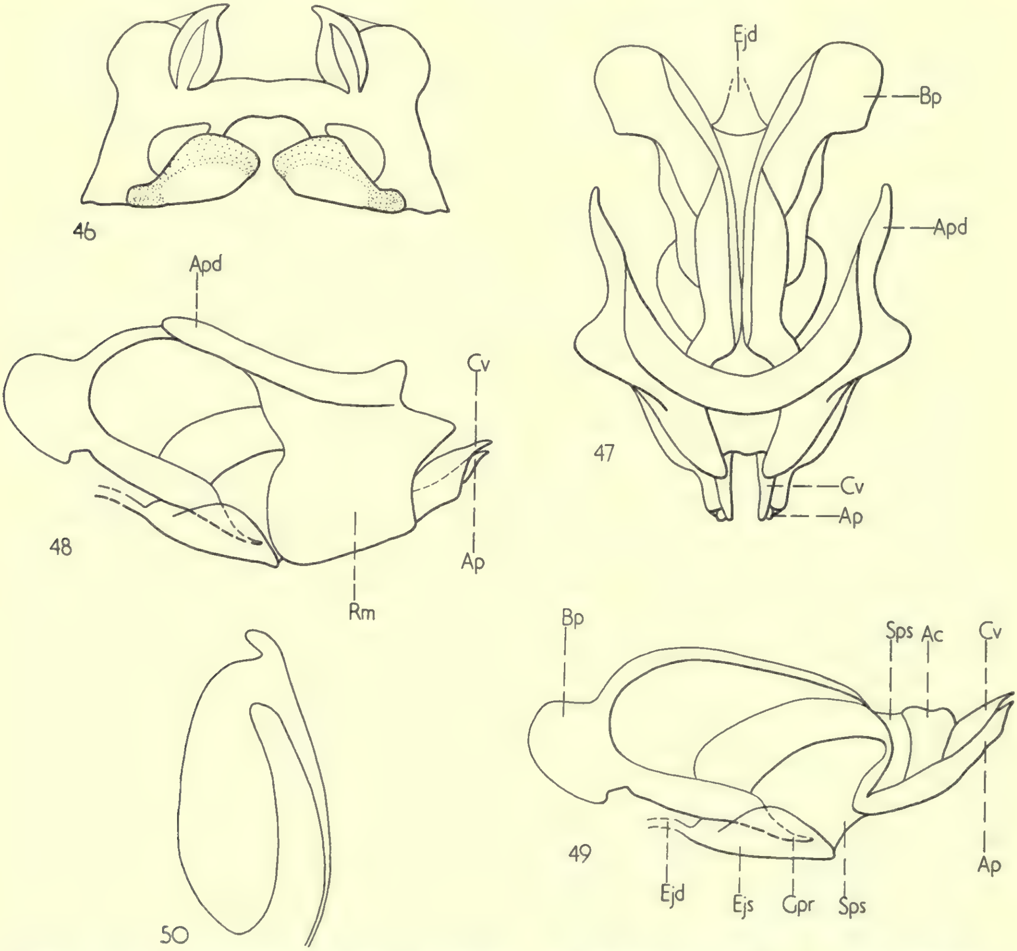
Measurements (mm.). Length of body, ♂ 17·7–23·7, ♀ 22·7–32·0. Length of pronotum, ♂ 3·9–5·0, ♀ 4·6–7·0. Length of tegmen, ♂ 16·7–23·6, ♀ 19·6–30·9. Length of hind femur, ♂ 11·3–14·8, ♀ 13·4–19·2. Maximum width of hind femur, ♂ 3·3–4·1, ♀ 4·3–5·8. Maximum width of head, ♂ 3·3–4·1, ♀ 4·2–5·7.

Ratios (twenty males and twenty females measured):

| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 1·18 | 1·24 | 1·29 | 3·19 | 3·39 | 3·64 | 4·06 | 4·33 | 4·85 | 1·39 | 1·52 | 1·71 |
| ♀ | 1·04 | 1·24 | 1·33 | 3·00 | 3·14 | 3·45 | 3·60 | 3·93 | 4·51 | 1·38 | 1·51 | 1·67 |

Discussion. There is considerable variation in size and general colouration in this species. Specimens from N. Africa are much larger than others and their general colouration is very like that of *A. simulatrix*; they can, if not examined in detail, be misidentified as the latter.

*A. strepens* differs from other species in the genus in the form of the pronotum; also it differs from the *thalassinus* group in having a broad hind femur and from the



FIGS. 46–50. *A. strepens* (Latr.), genitalia. 46, ♂ epiphallus; 47, ♂ phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 48, same, lateral view; 49, ♂ endophallus, lateral view; 50, ♀ spermatheca.

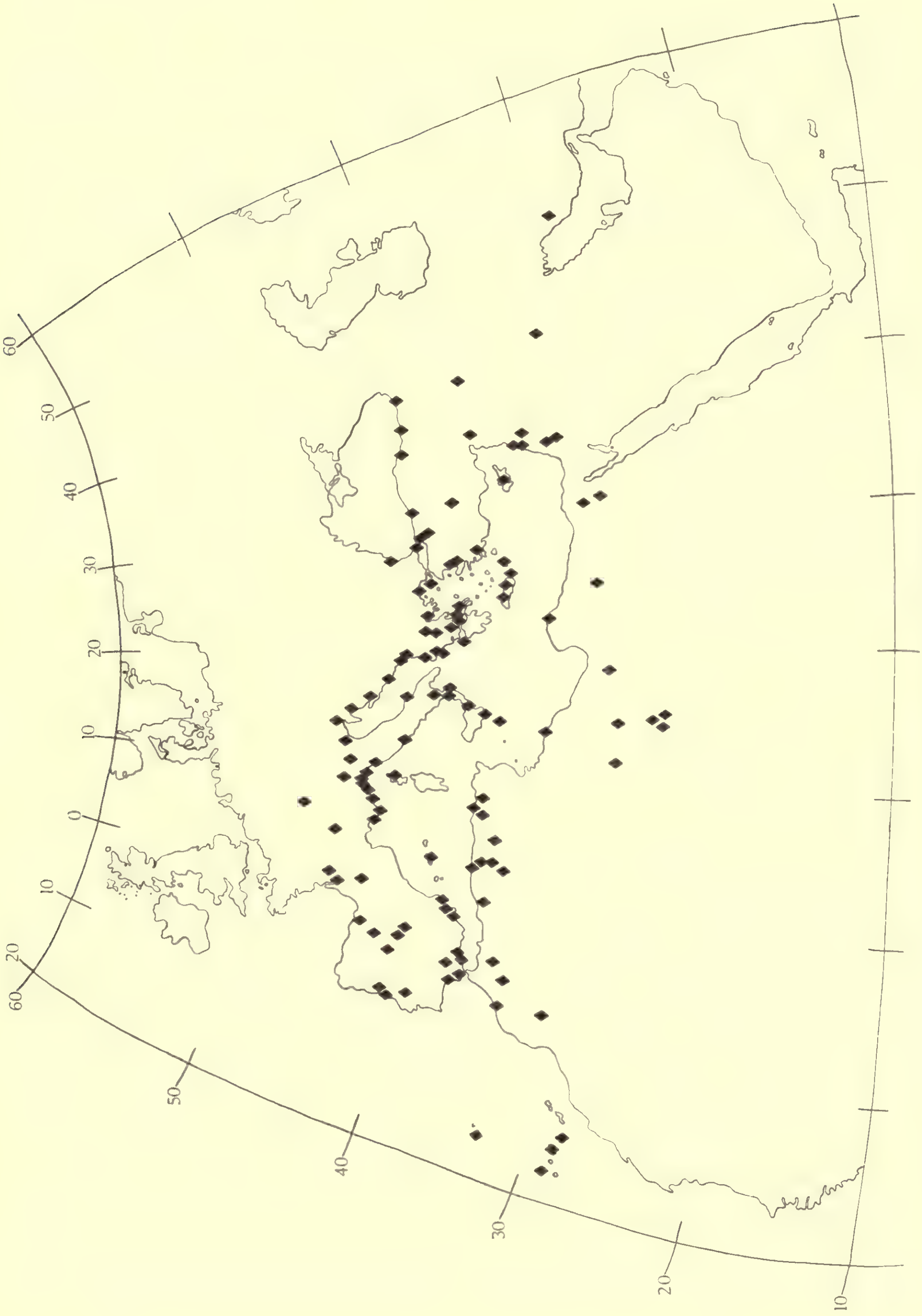

60
50
40
30
20
10
0
10
20
60
50
40
30
20
10

FIG. 51. *A. strepens* (Latr.), distribution map.

*simulatrix* group in that although the hind femur is broad the hind tibia is as long as the hind femur and has ten outer and eleven inner spines.

The author has examined the type ♂ of *Gryllus prasinus* Thunberg, deposited in Uppsala, and makes the above synonymy although this species has been previously considered a junior synonym (Stål, 1873 : 112) of *A. thalassinus*.

The type of *Acridium vittatum* Brullé has not been traced, but from the original description and figure it is obvious that Finot's synonymy should be accepted.

Distribution (Text-fig. 51). Nine hundred and eighty-four specimens of this species were examined and the following conclusions on its distribution are made:

FRANCE, May to October, December; CORSICA, August; SPAIN, April to May, August to October; BALEARIC Is., April, September to October; PORTUGAL, August; ITALY, July through to May; SICILY, September; SARDINIA, September; MALTA, January; GREECE, April to September; YUGOSLAVIA; July to September; ALBANIA, August; BULGARIA, August; CYPRUS, April to December; TURKEY, July to September, November; LEBANON, March to May, July, September, December; SYRIA, February to May, November; ISRAEL, April; IRAQ, June; IRAN, March; MADEIRA, June to July, November to December; CANARY Is., April, July to September, December, January; MOROCCO, June to September, December, ALGERIA, May to July, September to October; TUNISIA, January, April; LIBYA, February to May, July, September, November; UNITED ARAB REPUBLIC, March, May to August, October.

### ***Aiolopus oxianus*** Uvarov, 1926

(Text-figs. 10, 25, 52–56)

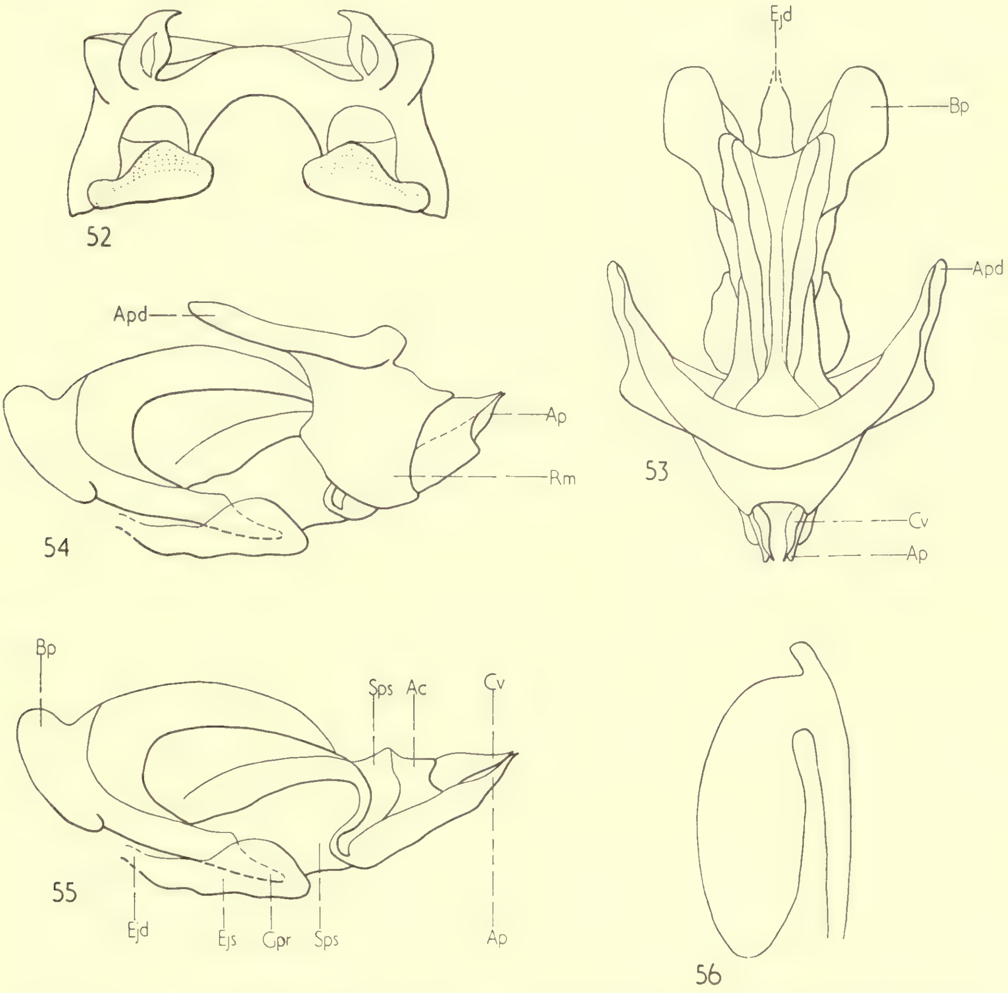
*Aiolopus oxianus* Uvarov, 1926: 347.

Type locality. USSR, " Kerki, on River Amu-Darya "; type ♂ deposited in Leningrad.

*Redescription.* ♂. Slender build, moderately rugulose. Antenna longer than combined lengths of head and pronotum, with twenty-two to twenty-four segments, the median segments of the flagellum elongate. Fastigium of vertex pentagonal, longer than wide, weakly concave with well defined margins; fastigial foveolae elongate, trapezoid, narrowing forwards, more than twice as long as maximum width, with well defined margins; frontal ridge weakly sulcate along most of length (Text-fig. 25), marginal carinulae low but distinct almost to clypeus, parallel along most of their length but converging slightly just below fastigium. Eye more rounded than in other species, little more than one and a quarter times higher than maximum width but twice as high as length of subocular groove. Pronotum narrow, weakly saddle-shaped, prozona constricted medially; metazona about one and three quarter times longer than prozona, with obtuseangular posterior margin; lateral plate of pronotum higher than wide; mesosternal interspace slightly wider than long. Tegmen long and narrow, well exceeding tip of hind femur. Hind femur narrow, ratio of length to maximum width about 4·1; hind tibia as long as hind femur, with ten outer and eleven inner spines, inner apical spurs slightly longer than outer pair; arolium very small (Text-fig. 10), about one quarter the length of claw. Supra-anal plate, cercus and subgenital plate normal for genus. Phallic complex (Text-figs. 52–55) with apodemes of zygoma of cingulum short, weakly sinuous and with apices weakly expanded dorsally, dorsal processes of zygoma weak or absent; basal valves of penis expanded apically but not recurved, apical penis valves slightly longer than normal.

General colouration brown with some ochraceous and black markings; head and pronotum with narrow median longitudinal ochraceous stripe sometimes present, ochraceous X-shaped pattern on dorsum of pronotum weak or absent; tegmen with broad dark transverse band basally and diffuse dark band medially, apical half mottled; hind wing hyaline; upper outer area of hind femur with three black spots, outer area with faint subapical black transverse band and faint ochraceous apical ring, inner area with three diffuse black spots, lower inner area reddish; hind tibia ochraceous in basal half interrupted by broad black ring one third the way along, apical one third reddish.

♀. As male but larger; eye a little more ellipsoid than male, about one and a half times as high as maximum width and one and a half times as high as length of subocular groove. Spermatheca as in Text-fig. 56.



FIGS. 52–56. *A. oxianus* Uv., genitalia. 52, ♂ epiphallus; 53, ♂ phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 54, same, lateral view; 55, ♂ endophallus, lateral view; 56, ♀ spermatheca.

Measurements (mm.). Length of body, ♂ 18·6–22·0, ♀ 27·6–29·5. Length of pronotum, ♂ 3·7–4·4, ♀ 4·8–5·8. Length of tegmen, ♂ 18·6–21·2, ♀ 24·5–27·1. Length of hind femur, ♂ 11·3–12·7, ♀ 14·2–16·1. Maximum width of hind femur, ♂ 2·7–3·2, ♀ 3·4–3·9. Maximum width of head, ♂ 3·3–3·7, ♀ 4·2–4·8.

Ratios (eight males and twelve females measured):

| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 1·12 | 1·16 | 1·21 | 3·97 | 4·08 | 4·18 | 4·82 | 4·99 | 5·21 | 1·59 | 1·67 | 1·73 |
| ♀ | 1·06 | 1·13 | 1·23 | 3·95 | 4·07 | 4·30 | 4·67 | 4·94 | 5·27 | 1·64 | 1·72 | 1·79 |

Discussion. Only a few specimens of this species have been examined and variation has been observed in size and general colouration.

The holotype of *A. oxianus* is deposited in the Leningrad Academy of Sciences and due to institutional policy was not available for study. However, from a study of the description and some paratypes in the BM(NH) it is clear that the name *oxianus* should be applied to the taxon described above.

Superficially *A. oxianus* strongly resembles *Epacromius tergestinus* (Charp.) but the form of the fastigial foveolae, the position of the intercalary vein of the medial area of the tegmen and the form of the male subgenital plate show that the species is more naturally placed in the genus *Aiolopus*. By its slender form and weakly saddle-shaped pronotum *A. oxianus* would appear to be closely related to *A. thalassinus*, from which species it may be distinguished by the elongate fastigial foveolae, longer antennae, completely sulcate frontal ridge and small arolium.

Distribution. (Thirteen males and twenty-two females).

USSR: Kerki, on River Amu-Darya, 4 ♂, 3 ♀, vii; Tchardzhui, on River Amu-Darya, 1 ♂, 2 ♀, viii; Syr Darya, Nadeshdinsky, 2 ♀, vi; Samarkand, R. Zaravshan, 1 ♀, vii; Khiva Town, 7 ♂, 7 ♀, " at light ", vii; Khiva distr., Gudzha, 1 ♂, 3 ♀, vii; Karmysh, 2 ♀, vii; Turkestan, 1 ♀.

### ***Aiolopus carinatus*** (Bei-Bienko, 1966) **comb. n.**

(Text-figs. 19, 20, 29, 57–60)

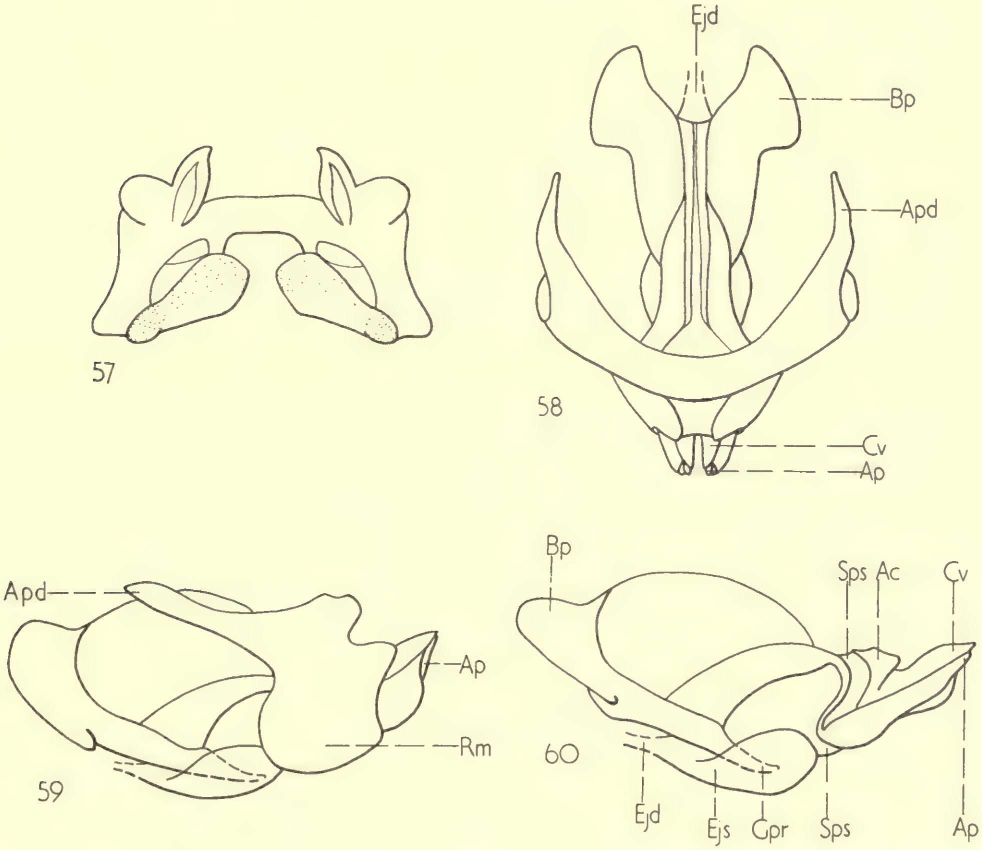
*Aeoloptilus carinatus* Bei-Bienko, 1966 : 1793, fig. 7.

Type locality. Komodo Islands, mountain plateau, 500–600 m.; type ♀ deposited in Leningrad.

*Redescription.* ♂. Integument moderately rugulose. Antenna as long as combined lengths of head and pronotum, with twenty-two segments. Fastigium pentagonal, forward angle rounded, weakly concave with margins fairly well developed at least in front of eyes; fastigial foveolae subrectangular with rounded angles, shallow, about one and a half times as long as maximum width; frontal ridge flat or weakly convex, very slightly narrowing upwards (Text-fig. 29). Eye ellipsoid, about one and half times as high as maximum width and almost two and a half times as high as length of subocular groove. Pronotum with dorsum weakly saddle-shaped (Text-figs. 19–20), prozona about three quarters the length of the metazona, latter with obtuse-angular posterior margin; lateral carinae moderately developed in prozona, parallel or very weakly divergent in front of first transverse sulcus and weakly divergent back to posterior transverse sulcus, almost obliterated in metazona; lateral plate of pronotum slightly higher than wide; mesosternal interspace slightly wider than long. Tegmen long, well exceeding apex of hind femur. Hind femur narrow, about four times as long as maximum width; hind tibia almost as long as hind femur, with twelve outer and twelve or thirteen inner spines, apical spurs simple with outer pair about one and a half times as long as inner pair; arolium half length of claw. Supra-anal plate, cercus and subgenital plate normal for genus. Phallic complex (Text-figs. 57–60) with zygoma of cingulum without dorsal processes and apodemes laterally flattened; basal valves of penis with large lateral expansions which are not recurved.

General colouration brown with dark brown and ochraceous markings. Lateral carinae of pronotum pale brown or ochraceous; tegmen with costal stripe ochraceous and complete, proximal half of tegmen with dark brown area extending from costa to cubital vein, vannal area hyaline, distal half of tegmen mottled hyaline and brown; hind femur brown with pregenicular ochraceous ring, upper outer area with two weak triangular brown spots, inner area ochraceous with two incomplete dark bands, lower inner area with weak orange tinge; hind tibia narrowly black basally, followed by broad ochraceous ring, apical two thirds greyish blue, sometimes apical quarter has weak orange tinge; hind wing hyaline with darker distal area.

♀. As male but slightly larger and more robust; ovipositor normal for genus.



FIGS. 57–60. *A. carinatus* (Bei-Bienko), male genitalia. 57, epiphallus; 58, phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 59, same, lateral view 60, endophallus, lateral view.

Measurements (mm.). Length of body, ♂ 16·8, ♀ 20·6–21·4. Length of pronotum, ♂ 3·0, ♀, 3·6–3·8. Length of tegmen, ♂ 14·8, ♀ 16·5–17·5. Length of hind femur, ♂ 10·0, ♀ 11·4–11·9. Maximum width of hind femur, ♂ 2·3, ♀ 2·5–2·8. Maximum width of head, ♂ 2·7, ♀ 3·2–3·3.

Ratios (one male and two females measured):

| | P/C | | FL/FW | | E/P | | E/F | |
|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| ♂ | 1·11 | | 4·35 | | 4·93 | | 1·48 | |
| ♀ | 1·12 | 1·15 | 4·25 | 4·56 | 4·58 | 4·60 | 1·45 | 1·47 |

Discussion. When originally described this species was thought to be generically distinct from *Aiolopus*, but for reasons explained above (p. 315) this generic separation is not accepted by the present author.

*A. carinatus* appears to be very closely allied to *A. th. tamulus*, from which it may be distinguished by the form of the fastigial foveolae, the pronotal carinae and the greater number of spines on the hind tibia.

Distribution. KOMODO IS.: Rintja, 1 ♂, 1 ♀, viii (Leningrad). SUMBA IS.: Melolo, 1 ♀, v (Willemse).

## ***Aiolopus longicornis*** Sjöstedt, 1909.

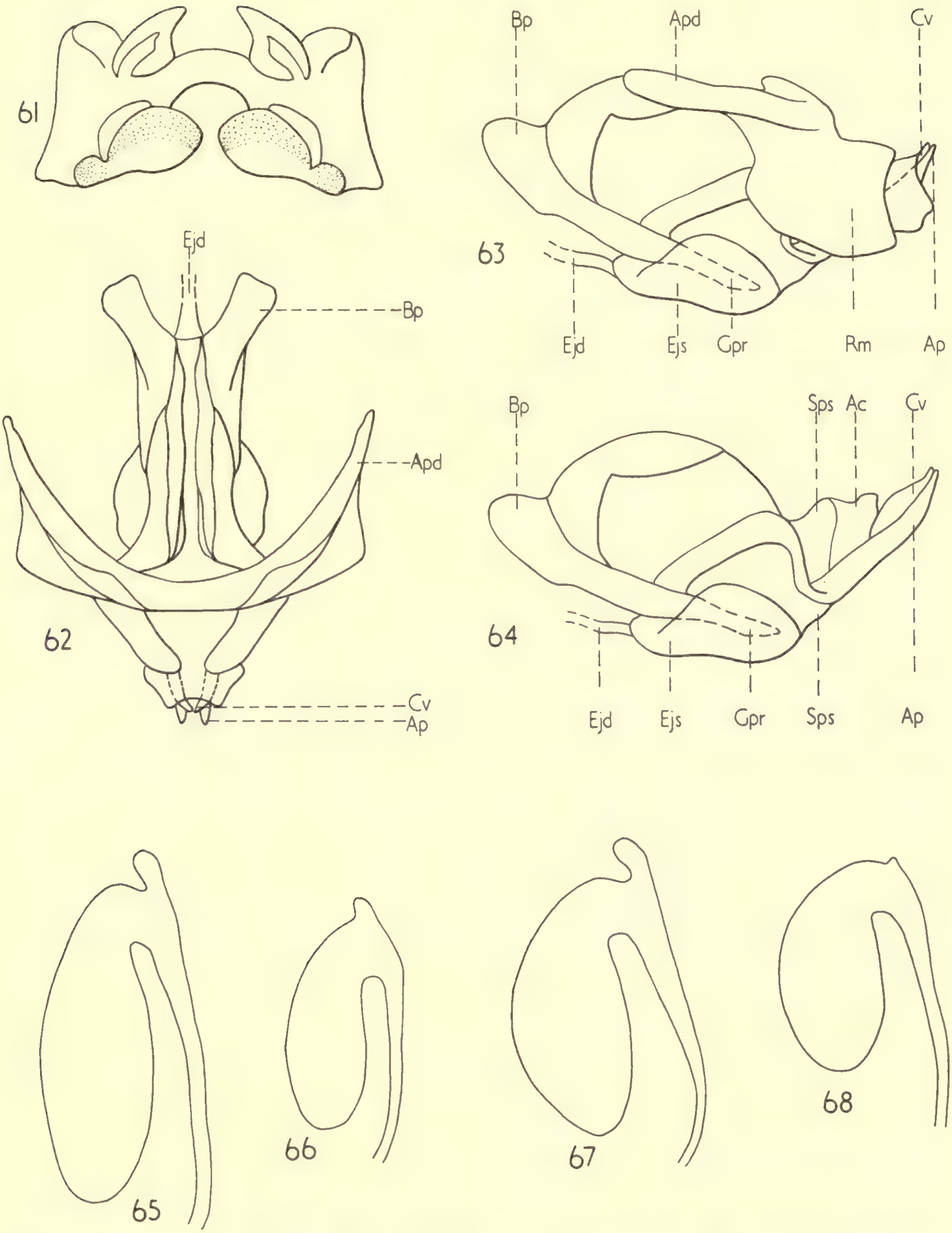
(Text-figs. 6, 17, 18, 26, 61–69)

*Aiolopus longicornis* Sjöstedt, 1909 : 156, 169.

Type locality. This species was described from two males and two females from Zanzibar and one female from Mombo, Usambara; one male specimen from Zanzibar bears Sjöstedt's type label, and this specimen is selected as LECTOTYPE and is deposited in Stockholm.

*Redescription.* ♂. Larger than average size for genus. Integument more strongly rugulose. Antenna clearly longer than combined lengths of head and pronotum, with twenty-two to twenty-four segments, the median segments elongate and about three times longer than broad. Fastigium broadly pentagonal, little longer than wide, moderately concave, strongly sloping forwards and roundly merging with frons, marginal carinulae well developed; fastigial foveolae almost rectangular, hardly narrowing forwards, weakly concave with moderately developed margins, the lower one often weak; frons oblique; frontal ridge coarsely and densely pitted, flat but impressed at median ocellus, merging with genae well before clypeus, lateral margins weakly convergent at apex (Text-fig. 26). Eyes oval, slightly less than one and a half times as high as maximum width and about twice the length of the subocular groove. Pronotum (Text-figs. 17–18) short and wide, hardly more than one and one third times longer than maximum width, moderately saddle-shaped, with prozona constricted medially; metazona with obtuse-angular posterior margin; lateral plate of pronotum higher than wide; mesosternal interspace slightly wider than long, weakly trapezoid, widening posteriorly. Tegmen relatively long (see E/P and E/F ratios). Hind femur (Text-fig. 6) moderately broad, FL/FW ratio about 3·7; hind tibia almost as long as hind femur, with nine outer and ten inner spines, inner apical spurs almost twice as long as outer spurs; arolium about half length of claw. Phallic complex (Text-figs. 61–64) with zygoma of cingulum with well developed dorsal processes and short apodemes; basal valves of penis hardly expanded laterally.

General colouration brown with ochraceous (or rarely green) and blackish markings; median longitudinal ochraceous stripe on head and pronotum normally well defined, ochraceous X-shaped


61
Bp
Apd
Cv
Ejd
-Bp
-Apd
62
-Cv
-Ap
63
Ejd
Ejs
Gpr
Rm
Ap
Bp
Sps
Ac
Cv
64
Ejd
Ejs
Gpr
Sps
Ap
65
66
67
68

FIGS. 61–68. *A. longicornis* Sjöst., genitalia. 61, ♂ epiphallus; 62, ♂ phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 63, same, lateral view; 64, ♂ endophallus, lateral view; 65, ♀ spermatheca of specimen from Chad area; 66, same, from Congo; 67, same, from Rukwa, Tanzania; 68, same, from Tingida, Tanzania.

pattern on dorsum of pronotum clearly defined; tegmen with two V-shaped ochraceous areas extending from anterior border to mid-line, apical half mottled, first and second vannal areas often ochraceous and when tegmen are folded this colouration forms a continuous stripe with that of head and pronotum; hind wing hyaline, sometimes with faintly yellowish base and sometimes with darkened apex and posterior border; hind femur with three weak black spots on upper outer area, external area mottled ochraceous black with the black colour often weak, ochraceous pregenicular ring distinct, apex black; inner area with complete preapical black band and medial black spot in dorsal half, lower inner area reddish; hind tibia with narrow basal black ring followed by broad ochraceous ring and then a broad black ring, ochraceous medially and apical third reddish.

♀. Larger and more robust than male. Spermatheca as in Text-figs. 65–68, with apical diverticulum varying from a small bubble-like projection to a finger-like tube.

Measurements (mm.). Length of body, ♂ 18·8–26·5, ♀ 25·3–31·7. Length of pronotum, ♂ 3·7–5·0, ♀ 4·4–5·5. Length of tegmen, ♂ 18·6–24·5, ♀ 23·7–27·8. Length of hind femur, ♂ 11·1–16·0, ♀ 14·8–17·6. Maximum width of hind femur, ♂ 3·3–4·3, ♀ 4·0–4·8. Maximum width of head, ♂ 3·6–5·0, ♀ 4·2–5·8.

Ratios (fifty males and twenty females measured):

| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 0·93 | 1·05 | 1·16 | 3·55 | 3·70 | 3·97 | 4·74 | 5·03 | 5·50 | 1·47 | 1·58 | 1·67 |
| ♀ | 0·92 | 1·04 | 1·09 | 3·53 | 3·68 | 3·84 | 4·87 | 5·14 | 5·48 | 1·56 | 1·61 | 1·66 |

Discussion. This species is intermediate between the *thalassinus* group and the *simulatrix* group, having the relatively longer hind femur and tibia and the saddle-shaped pronotum of the former and the stouter build and more strongly rugulose integument of the latter. *A. meruensis* is possibly its closest relative, also having a relatively broad head and short pronotum, but *longicornis* may be distinguished from *meruensis* by the broad frontal ridge, the elongate median segments of the antennal flagellum, the relatively longer tegmen and the narrower hind femur.

Distribution (Text-fig. 69). Two hundred and eighty-one specimens of this species were examined, indicating the following distribution:

NIGERIA (Chad area), February; CONGO, (former Belgian), August; ETHIOPIA, September, December; SOMALIA, August, October; KENYA, January, March, May, October; UGANDA, April to July; TANZANIA, throughout the year; BURUNDI, April; ZAMBIA, March, August.

## ***Aiolopus meruensis*** Sjöstedt, 1909

(Text-figs. 69–74)

*Aiolopus meruensis* Sjöstedt, 1909 : 156, 170.
*Aeolopus latus* Uvarov, 1922 : 545, **syn. n.**

Type locality. Meru (Tanzania): Flodhästsjöarne; type ♀ deposited in Stockholm.

*Redescription.*—♂. Integument moderately rugulose. Antenna at most as long as combined lengths of head and pronotum, with twenty-one to twenty-three segments. Fastigium of vertex rounded pentagonal, about as long as wide, weakly concave, with well defined margins; fastigial foveolae trapezoid, broad, barely one and a half times longer than wide, narrowing forwards, margins well defined but sometimes lower margin weak; frontal ridge flat or weakly sulcate at and below median ocellus, lateral margins gradually and continuously convergent upwards, moderately coarsely pitted. Eyes one and a half times as high as maximum width and almost twice as long as subocular groove. Pronotum slightly saddle-shaped, broad; metazona about one and two thirds the length of prozona, with obtuseangular or almost rounded posterior margin; lateral plate of pronotum slightly higher than wide; mesosternal interspace wider than long, trapezoid, widening posteriorly. Tegmen relatively short, E/F ratio about 1·47. Hind femur broad, ratio of length to width about 3·39; hind tibia almost as long as hind femur, with nine to ten outer and ten to eleven inner spines, inner apical spurs about twice as long as outer spurs;

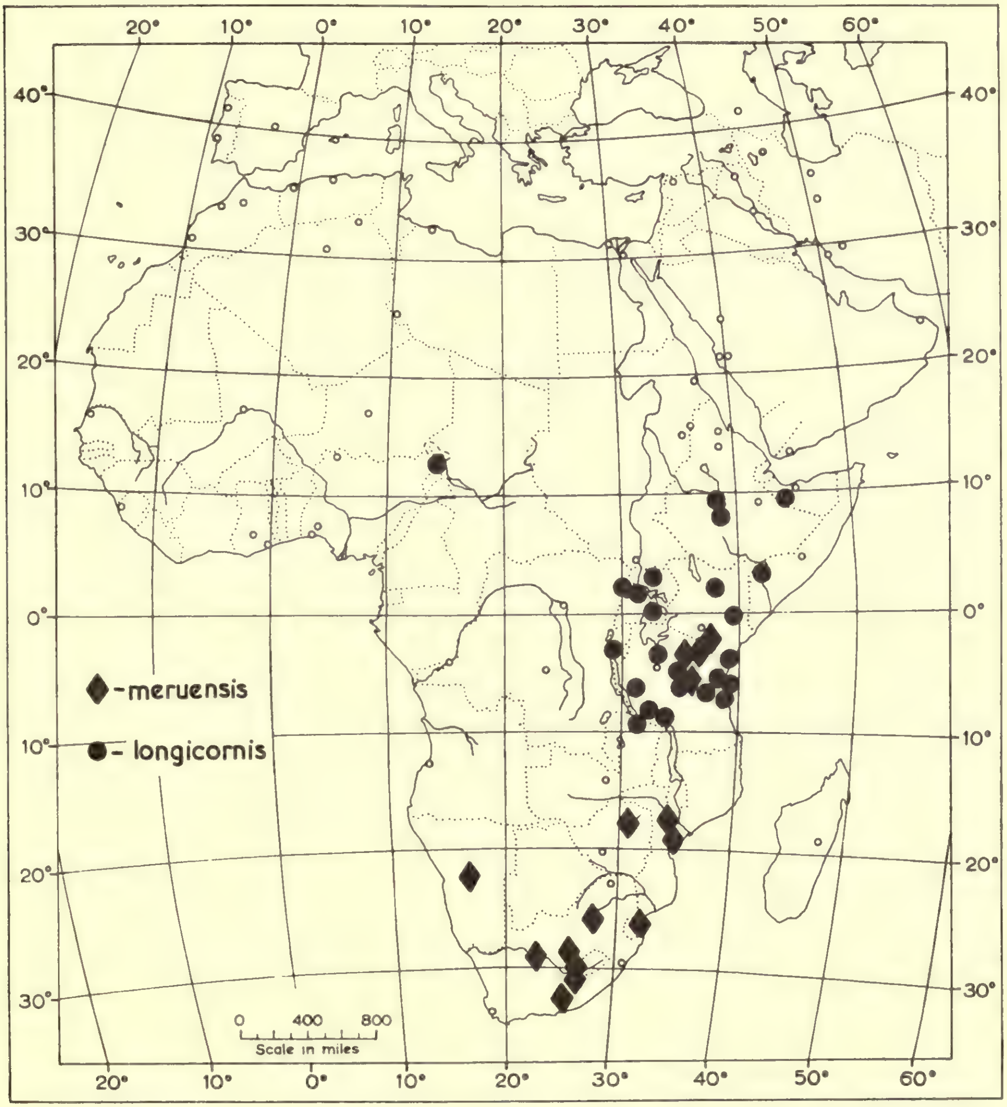
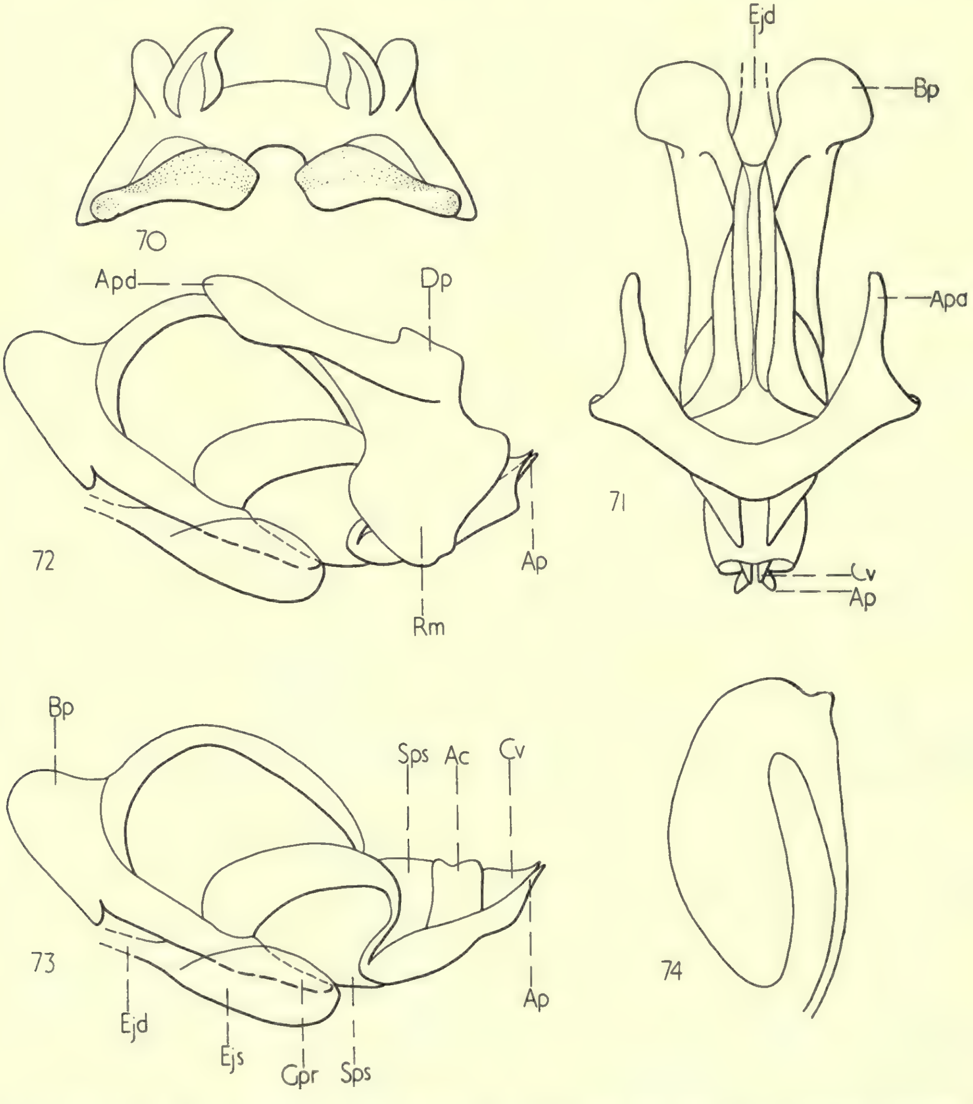


FIG. 69. *Aiolopus* spp., distribution map.

arolium half length of claw. Supra-anal plate, cercus and subgenital plate normal for genus, Phallic complex (Text-figs. 70–73) with zygoma of cingulum with well developed dorsal processes and lateral expansions at bases of apodemes, latter short; basal valves of penis with rounded lateral expansions.

General colouration brown with ochraceous or greenish markings; head and pronotum with median longitudinal pale stripe, pronotum with obvious X-shaped ochraceous pattern; tegmen with pale stripe in first vannal area and two transverse pale bands, apical third mottled; hind wing hyaline, often weakly pale yellow basally and with infumate apex; hind femur on outer side



FIGS. 70–74. *A. mervensis* Sjöst., genitolia. 70, ♂epiphallus; 71, ♂phallic complex, dorsal view, epiphallus; and ectophallic membrane removed; 72, same, lateral view; 73, ♂ endophallus, lateral view; 74, ♀ spermatheca.

with weak and diffuse basal, medial and apical obliquely transverse bands, on inner surface with two incomplete dark bands, lower inner area reddish; hind tibia ochraceous in basal third, then with incomplete blackish ring, apical one third to two thirds reddish.

♀. As male but larger and more robust. Eyes slightly less than one and a half times higher than wide and less than twice as high as length of subocular groove; spermatheca as in Text-fig. 74.

Measurements (mm.). Length of body, ♂ 16·0–21·2, ♀ 21·2–29·7. Length of pronotum, ♂ 3·2–4·1, ♀ 3·7–5·4. Length of tegmen, ♂ 14·3–19·8, ♀ 14·5–23·1. Length of hind femur, ♂ 9·5–12·8, ♀ 11·2–15·9. Maximum width of hind femur, ♂ 2·6–3·8, ♀ 3·2–4·8. Maximum width of head, ♂ 2·9–4·0, ♀ 3·7–5·1.

Ratios (fourteen males and twenty-nine females measured):

| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 1·02 | 1·09 | 1·17 | 3·18 | 3·39 | 3·66 | 3·76 | 4·42 | 4·89 | 1·28 | 1·47 | 1·64 |
| ♀ | 0·94 | 1·04 | 1·15 | 3·08 | 3·37 | 3·68 | 3·45 | 4·35 | 5·07 | 1·29 | 1·47 | 1·66 |

Discussion. In having a short, broad, slightly saddle-shaped pronotum, a broad hind femur and a hind tibia almost as long as the hind femur, *A. meruensis* is probably more closely related to *A. longicornis* Sjöstedt than to any other species in the genus; it is differentiated from *longicornis* by the narrower frontal ridge, the much shorter antennae, the shorter tegmen and the broader hind femur.

*A. meruensis* is variable over its range of distribution but the variations do not follow any particular geographical pattern. The form of the frontal ridge may vary from flat to weakly sulcate. The posterior margin of the pronotum varies from obtuseangular to almost rounded. The relative length of the tegmen is extremely varied; normally the tegmen extends to just beyond the tip of the hind femur but in the single specimen examined from Kilimanjaro it barely reaches the apex of the abdomen, in the specimens examined from Bloemfontein it just reaches the apex of the hind femur and in those from Lake Manyara, Tanzania, it extends well beyond the apex of the hind femur.

The original description of this species was not very diagnostic and caused it to be previously confused with *A. thalassinus thalassinus*. Uvarov's type ♀ of *A. latus* described from Bloemfontein and deposited in the BM(NH), when considered together with the other material of *meruensis* shows no significant difference and is therefore synonymized with *meruensis*.

Distribution (Text-fig. 69). The forty-five specimens examined were collected in the following countries:

KENYA, August; TANZANIA, January, April; RHODESIA, April; MOZAMBIQUE, February, May, July; SOUTH AFRICA, January, April, June, September, November; S.W. AFRICA, March.

## *Aiolopus thalassinus* (Fabricius, 1781)

This species is divided into four subspecies which are described and discussed below.

## *Aiolopus thalassinus thalassinus* (Fabricius, 1781) **stat n.**

(Text-figs. 1–5, 11, 12, 21, 75–84, 90, 91)

*Gryllus thalassinus* Fabricius, 1781 : 367.
*Acridium grossum* Costa, 1836 : 25, pl. 3, fig. 4, a–d; Fischer, L. H., 1853 : 361.
*Acridium laetum* Brullé, 1840 : 77, pl. 5, figs. 10–10a; Finot, 1895 : 423.
*Epacromia angustifemur* Ghiliani, 1869 : 179; Kirby, 1910 : 191.
*Ochrophlebia* (?) *savignyi* Krauss, 1890 : 261 (Savigny, Desc. Egypt, pl. 6, fig. 15 (3)); Storey, 1919 : 54.
*Epacromia lurida* Brancsik, 1895 : 250, **syn. n.**
*Aiolopus thalassinus kivuensis* Sjöstedt, 1923 : 18; Sjöstedt, 1929 : 24.
*Aiolopus acutus* Uvarov, 1953 : 111, figs. 129–131, **syn. n.**

Type locality. The type was in Allioni's collection in Turin but has been destroyed by fire. NEOTYPE (♀) erected bearing the following data: SWITZERLAND: Locarno, Maggia Delta, 16.ix.1929 (*Zeuner*); it is deposited in the BM(NH).

*Redescription.* ♂. Moderately rugulose. Antenna as long as combined lengths of head and pronotum, with twenty-two to twenty-four segments. Fastigium pentagonal, forward angle rounded, or subangular in specimens from Ethiopian and Oriental regions, moderately concave with well defined margins; fastigial foveolae trapezoid, normally slightly narrowing forward, about twice as long as maximum width; frontal ridge flat or slightly convex, sparsely pitted, lateral margins parallel except at apex where they converge slightly (Text-fig. 21). Eye oval, about one and a half times as high as maximum width and almost twice as high as length of subocular groove. Pronotum slightly saddle-shaped; metazona almost one and two thirds as long as prozona; latter constricted medially and with weak lateral "shoulders"; posterior margin of metazona obtuseangular (Text-figs. 11–12); lateral plate of pronotum slightly higher than wide; mesosternal interspace almost square. Tegmen long, well exceeding tip of hind femur. Hind femur narrow, about four times as long as maximum width (for range see ratios below); hind tibia as long as or only very slightly shorter than hind femur (Text-fig. 5), with ten outer and eleven inner spines, inner apical spurs about one and half times as long as outer spurs; arolium half length of claw. Supra-anal plate, cercus and subgenital plate normal.

Phallic complex (Text-figs. 75–78) with epiphallus having moderately developed outer lophal lobe; zygoma of cingulum with longer apodemes and poorly developed dorsal processes; basal valves of penis with lateral expansions strongly developed and recurved.

General colouration green or brown with ochraceous and black markings. Pronotum with or without median longitudinal ochraceous stripe and with or without ochraceous criss-cross pattern on dorsum, if without then dorsum unicolorously green or ochraceous and with blackish bordering colouration below "shoulders"; costal area of tegmen with interrupted ochraceous stripe, generally mottled and without clearly defined transverse bands; hind wing hyaline, sometimes weakly yellowish green basally and often with darkened apex; hind femur on upper outer area with two triangular black spots which continue onto outer area as incomplete oblique fasciae and on inner area as complete fasciae, apex of hind femur blackish with preceding complete or incomplete ochraceous ring; hind tibia narrowly black basally, followed by broader ochraceous ring, apical two thirds normally reddish, the red colouration separated from ochraceous ring by greyish ring.

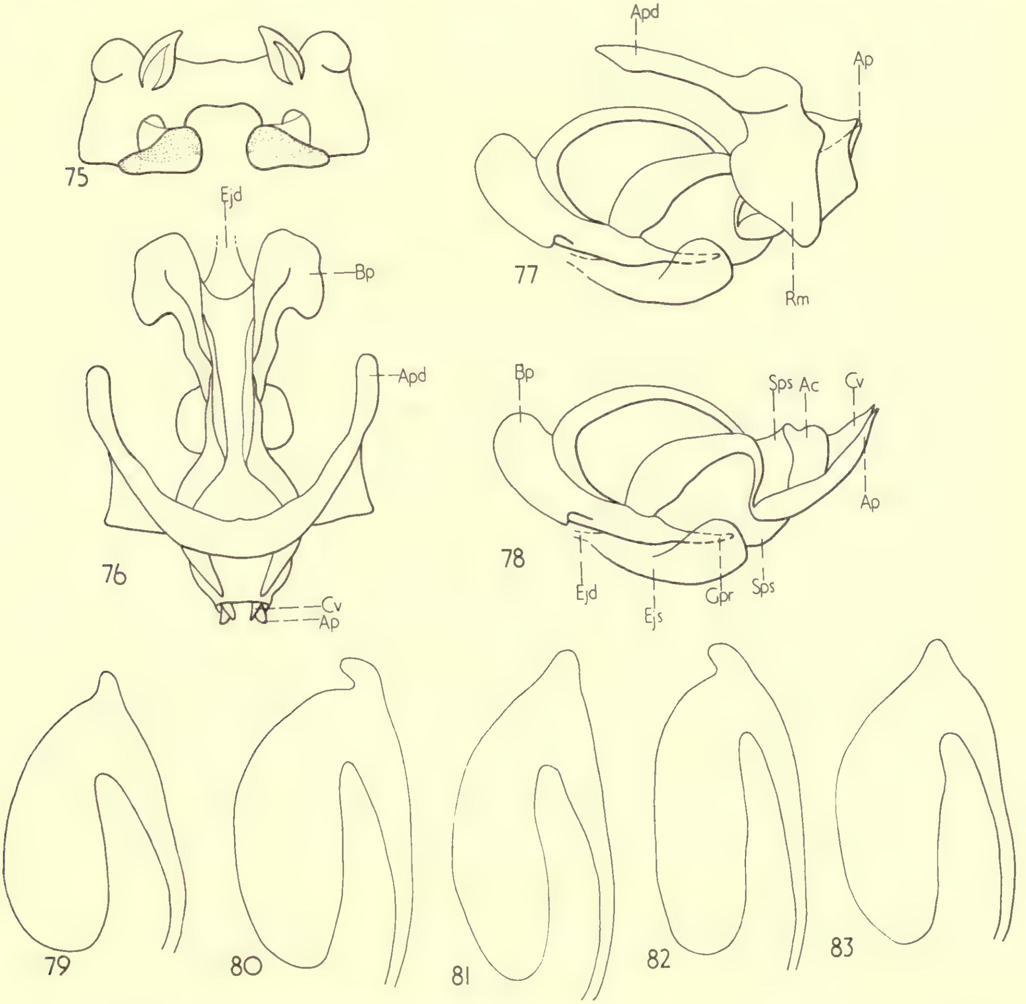
♀. As ♂ but larger and more robust; frontal ridge often more convex; spermatheca (Text-figs 79–83) variable, with pre-apical diverticulum of varying lengths; ovipositor as in Text-figs. 2–3.

Measurements (mm.). Length of body, ♂ 15·2–21·2, ♀ 19·8–29·3. Length of pronotum, ♂ 2·8–4·0, ♀ 3·8–5·5. Length of tegmen, ♂ 14·2–20·5, ♀ 17·0–26·3. Length of hind femur, ♂ 9·5–12·2, ♀ 10·9–16·5. Maximum width of hind femur, ♂ 2·3–3·0, ♀ 2·7–3·8. Maximum width of head, ♂ 2·6–3·4, ♀ 3·1–4·5.

Ratios (forty specimens of each sex measured):

| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 1·04 | 1·18 | 1·27 | 3·81 | 4·06 | 4·33 | 4·57 | 4·99 | 5·44 | 1·42 | 1·62 | 1·81 |
| ♀ | 1·10 | 1·20 | 1·37 | 3·80 | 4·10 | 4·50 | 4·25 | 4·86 | 5·22 | 1·52 | 1·67 | 1·83 |

Discussion. *A. th. thalassinus* is widely distributed in the southern palaearctic, ethiopian and western oriental regions (see Text-fig. 84), and consequently shows great variability. Its general colouration varies from almost completely green,



FIGS. 75–83. *A. thalassinus thalassinus* (Fabr.), genitalia. 75, ♂ epiphallus; 76, ♂ phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 77, same, lateral view; 78, ♂ endophallus, lateral view; 79, ♀ spermatheca of specimen from France; 80, same, of specimen from Morocco; 81, same, of specimen from Kenya; 82, same, of specimen from South Africa; 83, same, of specimen from India.

through green with brown markings, to brown with ochraceous and black markings. The pronotum always has a contrasting pattern dorsally and laterally suggesting the presence of lateral carinae. The hind tibia sometimes lacks its reddish colouration, cream or grey being the replacement colour. The anterior angle of the fastigium varies from rounded to quite sharp, specimens with the latter character having been described as a distinct species, *A. acutus* Uvarov (1953). However, as all intermediate forms of fastigium can be found and there is no geographical evidence to support this separation, Uvarov's species is synonymized. The frontal ridge varies from slightly convex to flat with a depression at the median ocellus.

A small series from Angola, collected from a mangrove swamp 4 mls. S.E. of Luanda, which was studied shows rather greater than average variation in the length of the pronotum and tegmen and the width of the hind femur.

Ratios of measurements of Angola specimens:

| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 1·03 | 1·06 | 1·09 | 3·81 | 3·86 | 3·92 | 4·28 | 4·49 | 4·87 | 1·40 | 1·46 | 1·49 |
| ♀ | 1·00 | 1·04 | 1·08 | 3·90 | 3·97 | 4·05 | 4·34 | 4·39 | 4·43 | 1·40 | 1·43 | 1·47 |

As only six males and three females were examined and other specimens from other parts of Angola appear quite normal, no taxonomic significance is attached to this series at present.

In previous publications the lists of synonymy for this subspecies are at variance with the list given in the present paper; the latter is arrived at as follows:

*Gryllus prasinus* Thunberg is removed from the synonymy of this subspecies and synonymized with *A. strepens* (Latreille).

The type of *Oedipoda pulverulenta* Fischer de Waldheim, 1846 is deposited in Leningrad and because of institutional policy was not available for study. Professor G. Ya Bei-Bienko has examined the specimen and reports that it does not belong to the genus *Aiolopus*, as thought by Fischer, L. H. (1853 : 36), and is to be referred to the genus *Epacromius*.

The type of *Acridium grossum* Costa is destroyed and Fischer's synonymy is accepted. Similarly the type of *Acridium laetum* Brullé is destroyed and Finot's synonymy is accepted.

The type of *Epacromia angustifemur* Ghiliani, which is deposited in Turin, is also unavailable for study, but from the original description it is clear that Kirby's synonymy is correct.

*Ochrophlebia* (?) *savignyi* Krauss was described from a drawing by Savigny (1809–13 : pl. 6, fig. 15 (3)) and after examination of Savigny's figure Storey's synonymy is accepted.

The type of *Epacromia lurida* Brancsik was deposited in Budapest but has been destroyed. However, Uvarov (1953 : 109) states that he examined the type and found it " appears to be a species of the *thalassinus* group ". The type locality is " Boroma, Zambesi ", and after examination of material from areas close to the type locality the present author synonymizes this name with *A. thalassinus*.

*A. th. kivuensis* Sjöstedt was described from a single female specimen from Lake Kivu, in the former Belgian Congo, and is deposited in Stockholm. An examination of Sjöstedt's type has shown that its present synonymy is correct.

*A. acutus* Uvarov was described from a series of specimens from Katanga, in the former Belgian Congo, and the type ♂ is deposited in the BM(NH). It is synonymized for the reasons stated above.

Distribution (Text-fig. 84). From the four thousand specimens examined the following general conclusions are drawn:

FRANCE, June to November; SPAIN, April, September, October; BALAERIC IS., September, October; PORTUGAL, August; SWITZERLAND, September; ITALY, September to November; SARDINIA, September; AUSTRIA, August; CZECHOSLOVAKIA, August; HUNGARY, March, July, October; YUGOSLAVIA, May to June, August to September; ALBANIA, June, August to September; GREECE, May to August; CYPRUS, May, August, October; TURKEY, June to September; USSR, June to September; KASHMIR, May to October; NEPAL, July, September to October; INDIA, February to December; WEST PAKISTAN, May through to January; AFGHANISTAN, April; PERSIA, March to December; IRAQ, May to July, September to December, February; SYRIA, April to August; LEBANON, March, May to June; ISRAEL, May to June August, October, January; JORDAN, March to April, June; SAUDI ARABIA, All year round; YEMEN, June, August to September, December through to April; SOUTHERN YEMEN, May through to March; MUSCAT AND OMAN, August to September, January to May; BAHREIN, May; SOCOTRA, August, January to April; EGYPT, May to November, January to February; LIBYA, September, February to July; TUNISIA, March to April; ALGERIA, October, March to July; MOROCCO, June to July, November; MADEIRA, July to August, November to December; CANARY IS., July through to May; CAPE VERDE IS., No dates; MALI, May through to January; SENEGAL, August to September; GAMBIA, April; GUINEA, No dates; SIERRA LEONE, No dates; GHANA, All year round; TOGO, February, May; NIGERIA, May to October, December through to March; SUDAN, May to August, November to December, February; ETHIOPIA, May through to March; SOMALIA, June, August through to March; KENYA, January to November; UGANDA, May through to March; RUANDA, August; CONGO, May to October, December, February; ANGOLA, March to November; ZAMBIA, October through to August; TANZANIA, All year round; MALAWI, June, December; MOZAMBIQUE, June to August, October to November, February, April; COMORO IS., September to October; S. W. AFRICA, June, October, December; BOTSWANA, May, October; RHODESIA, October through to August; SOUTH AFRICA, August through to June.

### ***Aiolopus thalassinus rodericensis*** (Butler, 1876) **stat. n.**

(Text-figs. 84–91)

*Epacromia rodericensis* Butler, 1876 : 410.
*Epacromia famulus* [*sic*] var. *pusilla* I. Bolivar, 1895 : 378; I. Bolivar, 1912 : 270.
*Chortoicetes rodericensis* (Butler, 1876) Kirby, 1910 : 193.
*Aeolopus aldabrensis* I. Bolivar, 1912 : 269; Dirsh, 1963 : 264.

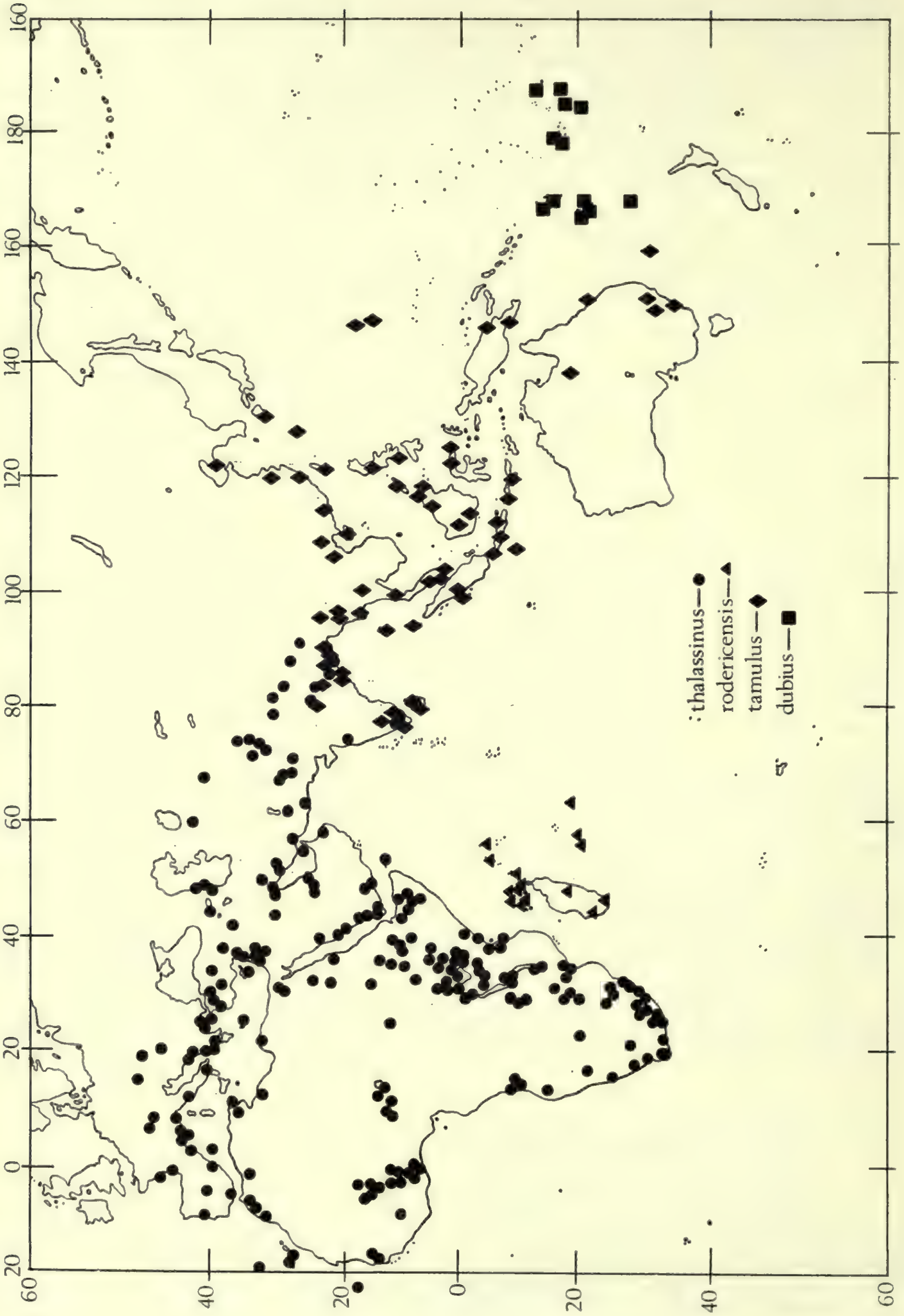

160
180
160
140
120
100
80
60
40
20
0
20
60
40
20
0
20
40
60
thalassinus—●
rodericensis—▲
tamulus—◆
dubius—■

FIG. 84. *A. thalassinus* subspp., distribution map.

*Aeolopus dociostauroides* I. Bolivar, 1912 : 269; Dirsh, 1963 : 264.
*Aeolopus fasciatipes* I. Bolivar, 1912 : 270; Dirsh, 1963 : 264.
*Aeolopus perpusillus* I. Bolivar, 1912 : 270; Dirsh, 1963 : 264.
*Aiolopus rodericensis* (Butler, 1876) Uvarov, 1928 : 364.

Type locality. Rodriguez Is., lectotype ♂ designated by Dirsh (1963) and deposited in the BM(NH).

Differs from nominate subspecies in the following ways:

♂. Fastigial foveolae trapezoid, narrowing forwards, about one and a half times as long as maximum width, very shallow; frontal ridge finely and sparsely pitted, gradually and continuously narrowing upwards, slightly convex, flat or slightly sulcate at and below median ocellus and with very weak lateral carinulae; mesosternal interspace slightly wider than long; tegmen shorter, E/P ratio averaging 4·60; hind femur wider, ratio of length to maximum width averaging 3·78. Phallic complex (Text-figs. 85–88) with basal valves of penis hardly expanded and not recurved.

♀. E/P ratio averaging 4·58; FL/FW ratio averaging 3·79; spermatheca as in Text-fig. 89.

General colouration ochraceous and brown or greenish with median longitudinal ochraceous stripe which extends forwards weakly onto head; pronotum normally with cross-shaped ochraceous pattern on dorsum or if without then median stripe widens forwards in prozona. Hind femur with three incomplete dark fasciae on outer surface which are often weak and irregular; inner surface with three black fasciae, apical one always complete, median fascia often weak, and basal fascia either occasionally absent or complete and partially fused with median fascia; hind tibia with narrow basal black band follosed by broad ochraceous band, then with narrow incomplete black band, then broad bluish band which continues dorsally to apex of tibia but is interrupted apico-ventrally by blackish area. Tegmen with three incomplete dark bands, the apical one often dispersed, costal area with broken ochraceous or green stripe.

Measurements (mm.). Length of body, ♂ 13·8–21·5, ♀ 19·2–28·7. Length of pronotum, ♂ 2·8–4·2, ♀ 3·8–5·4. Length of tegmen, ♂ 12·4–20·6, ♀ 16·4–24·9. Length of hind femur, ♂ 7·8–12·7, ♀ 11·4–15·6. Maximum width of hind femur, ♂ 2·3–3·4, ♀ 3·0–4·1. Maximum width of head, ♂ 2·5–3·6, ♀ 3·3–4·6.

Ratios (twenty specimens of each sex measured):

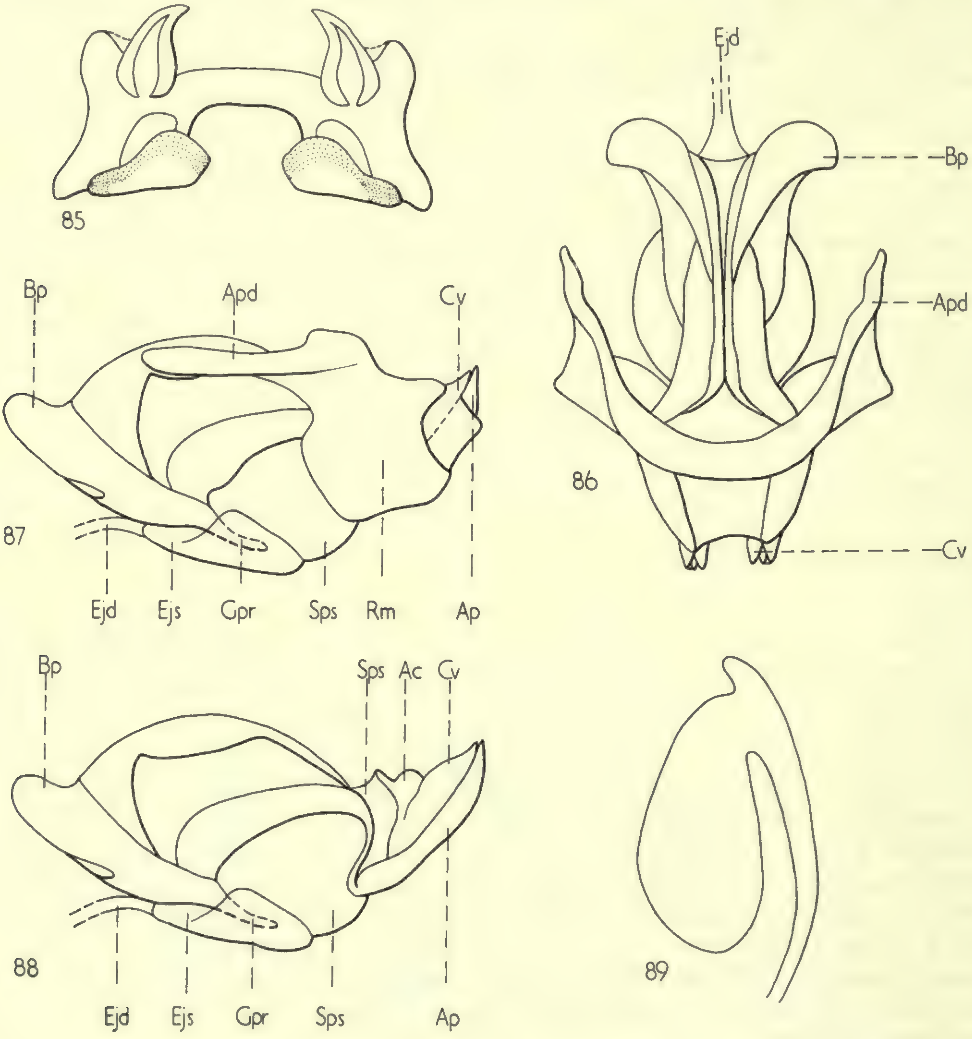
| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max |
| ♂ | 1·06 | 1·15 | 1·23 | 3·39 | 3·78 | 4·12 | 4·27 | 4·60 | 4·90 | 1·41 | 1·51 | 1·67 |
| ♀ | 1·07 | 1·12 | 1·21 | 3·64 | 3·79 | 4·00 | 4·09 | 4·58 | 5·08 | 1·41 | 1·58 | 1·79 |

Discussion. This subspecies is quite variable in size, colouration and degree of flatness of the frontal ridge. Dirsh (1963 : 267), in discussing the species he synonymized with *A. rodericensis*, states " Other characters, such as width of frontal ridge which depends upon the stoutness of head do not exceed the range of variability; *A. laticosta* (I. Bol.) being one of the extreme variants in this respect ". In fact it is the overall shape of the frontal ridge which is different in *laticosta*, and coupled with the short hind tibia and the form of the pronotum the present author disagrees with Dirsh's synonymy and places *laticosta* into synonymy with *A. simulatrix* (Walker).

*A. th. rodericensis* has been previously regarded as a species and Dirsh (1963) considered it to belong to the " *savignyi* group " by virtue of its broad hind femur.

The present author regards this taxon as a subspecies of *A. thalassinus*; the range of stoutness of the hind femur falls between that of *A. simulatrix* (= *A. savignyi*) and that of *A. thalassinus*, the hind tibia is not as short as in *A. simulatrix*, and the form of the frontal ridge and pronotum are of the same type as *A. thalassinus*.

Morphological differences between *A. th. rodericensis* and the mainland subspecies are not very clearly defined; in *rodericensis* the head tends to be broader and this is demonstrated in the P/C ratio, the tegmen is shorter as is demonstrated in the E/P ratio, the hind femur is broader as is shown in the FL/FW ratio, the fastigial foveolae are slightly more square and there is no red colouration on the hind tibia.



FIGS. 85–89. *A. thalassinus rodericensis* (Butler), genitalia. 85, ♂ epiphallus; 86, ♂ phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 87, same, lateral view; 88, ♂ endophallus, lateral view; 89, ♀ spermatheca.

A comparison of the E/P and FL/FW ratios for both *thalassinus* and *rodericensis* is given in Text-figures 90 and 91.

Certain very general trends are visible in this subspecies across its range from Madagascar to the Seychelles Islands; as the populations extend eastwards the individuals tend to become smaller, and the tegmen becomes relatively shorter and the frontal ridge flatter; the latter even tends to have very weak lateral carinulae at and below the median ocellus. However, these trends are not always complete, and specimens showing characters against the general trends are often encountered.

*Type localities of synonymized species.*

*Epacromia famulus* [*sic*] var. *pusilla* I. Bol. Lectotype ♂, Mahe (Seychelles), designated by Dirsh (1963 : 267) and deposited in Paris.

*Aeolopus aldabrensis* I. Bol. Lectotype ♀, Aldabra, designated by Dirsh (1963 : 267) and deposited in BM(NH).

*Aeolopus dociostauroides* I. Bol. Lectotype ♂, Coetivy (Seychelles), designated by Dirsh (1963 : 267) and deposited in BM(NH).

*Aeolopus fasciatipes* I. Bol. Lectotype ♀, Farquar Atoll, designated by Dirsh (1963 : 267) and deposited in BM(NH).

Distribution (Text-fig. 84). Two hundred and thirty-one specimens of this subspecies were examined and the following conclusions concerning its distribution were made:

MADAGASCAR, April to June, November through to February; REUNION, June; MAURITIUS, January, May; RODRIGUEZ IS., February; ALDABRA GROUP, May to December; SEYCHELLES GROUP, February to December.

### ***Aiolopus thalassinus tamulus*** (Fabricius, 1798) **stat. n.**

(Text-figs. 22, 23, 84, 92–96)

*Gryllus tamulus* Fabricius, 1798 : 195.
*Gomphocerus tricoloripes* Burmeister, 1838 : 649; Kirby, 1910 : 192.
*Epacromia rufostriata* Kirby, 1888 : 550, **syn. n.**

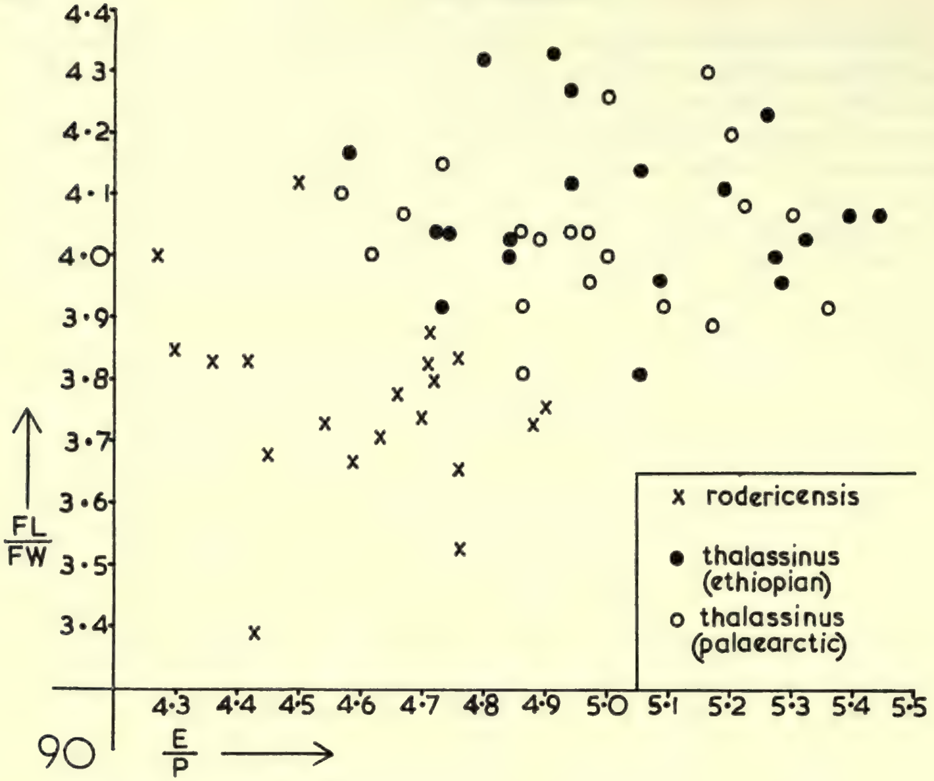
Type locality. " Ind: or. et China ", lectotype ♂ designated by Key (1967) and deposited in the Copenhagen Mus.

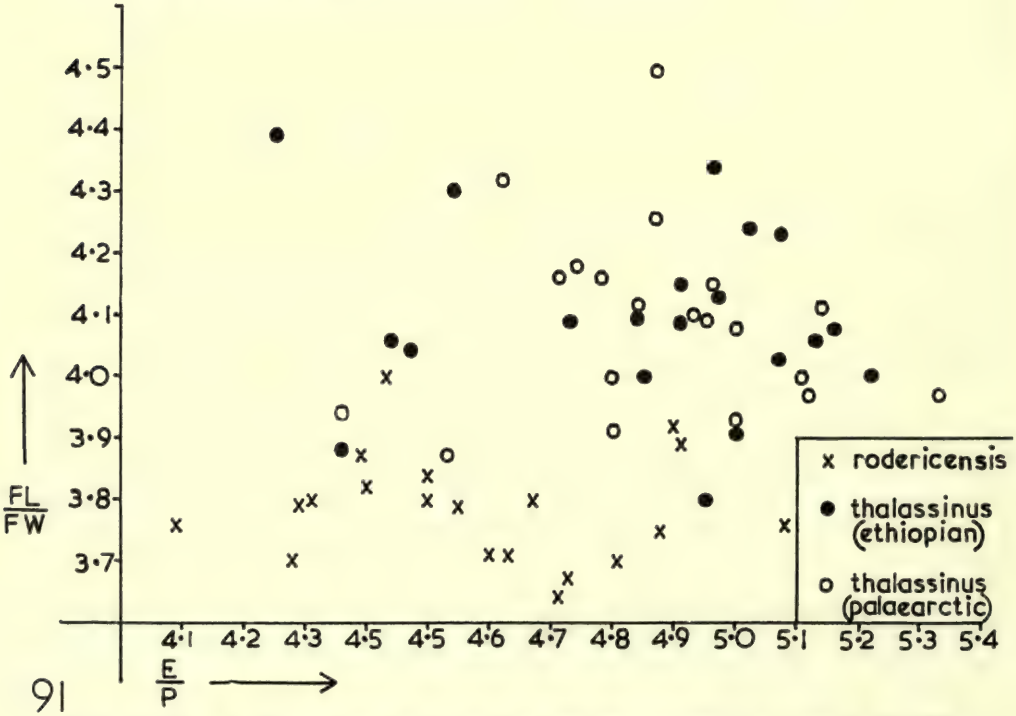
Differs from nominate subspecies in the following ways:—

♂. Fastigium with forward angle more acute (Text-figs. 22–23); fastigial foveolae narrowing more strongly anteriorly (Text-figs. 22–23), frontal ridge flat and continually narrowing upwards (Text-figs. 22–23); or weakly sulcate and with weak lateral carinulae, and junction with fastigium more angular; pronotum with " shoulders" of prozona more parallel in prozona and sometimes even with very weak lateral carinae in prozona; posterior margin of pronotum more rounded. Phallic complex (Text-figs. 92–95) with basal valves of penis less expanded laterally and not recurved.

♀. Spermatheca as in Text-fig. 96.

General colouration differs in that ochraceous or green stripe along costal area of tegmen is usually complete; external area of hind femur without oblique fasciae; hind tibia with red





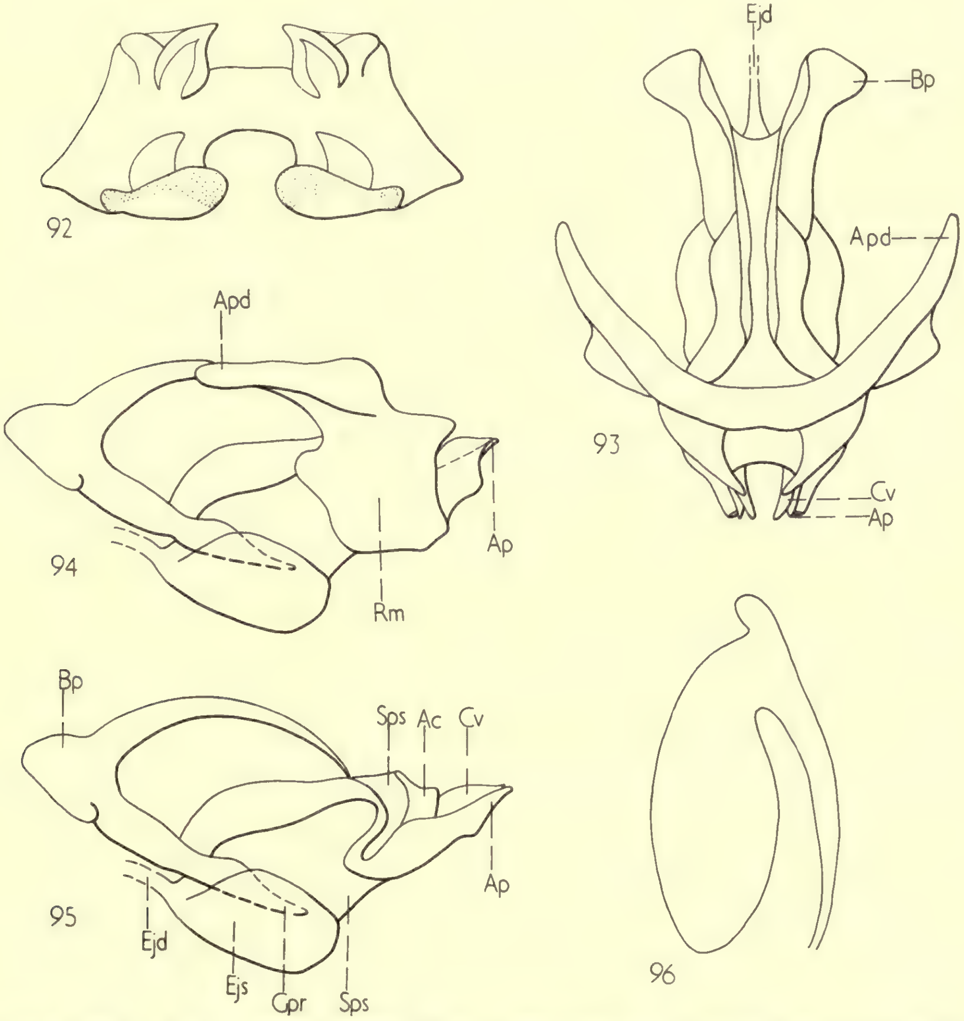
FIGS. 90–91. *A. thalassinus* sspp., scatter diagrams comparing values of FL/FW against E/P. 90, males; 91, females.

colouration in apical third only or not at all, and broadly separated from median black band by broad bluish grey band.

Measurements (mm.). Length of body, ♂ 17·9–22·2, ♀ 21·7–29·5. Length of pronotum, ♂ 3·3–4·3, ♀ 4·0–5·3. Length of tegmen, ♂ 16·8–21·5, ♀ 19·8–27·0. Length of hind femur, ♂ 10·5–13·1, ♀ 11·7–15·9. Maximum width of hind femur, ♂ 2·5–3·2, ♀ 2·9–3·8. Maximum width of head, ♂ 2·7–3·5, ♀ 3·5–4·5.

Ratios (twenty specimens of each sex measured):

| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 1·11 | 1·21 | 1·32 | 4·00 | 4·15 | 4·38 | 4·67 | 5·07 | 5·51 | 1·50 | 1·62 | 1·72 |
| ♀ | 1·12 | 1·19 | 1·29 | 4·03 | 4·21 | 4·53 | 4·69 | 5·03 | 5·44 | 1·49 | 1·66 | 1·75 |



FIGS. 92–96. *A. thalassinus tamulus* (Fabr.), genitalia. 92, ♂ epiphallus; 93, ♂ phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 94, same, lateral view; 95, ♂ endophallus, lateral view; 96, ♀ spermatheca.

Discussion. This subspecies shows considerable variation in size and general colouration to the same extent as in the nominate subspecies. In the Australasian region the fastigium of the vertex tends to become more rounded, the frontal ridge narrows less conspicuously upwards and the hind tibia tends to lose the red colouration. As a whole Australasian populations of *tamulus* show a general transition towards the Polynesian subspecies *dubius* but may be easily separated from the latter by the absence of a complete black-brown colouration on the ventral surface of the hind tibia.

*A. thalassinus tamulus* was previously regarded as a distinct species and identified by the form of the frontal ridge and fastigium and the colouration of the hind tibia. These characters are fairly distinct in populations in east India and S.E. Asia but gradually become less distinct and merge with *thalassinus* in west India and, as mentioned above, with *dubius* in Polynesia. For this reason *tamulus* is here considered as a subspecies of *thalassinus*.

The type of *Gomphocerus tricoloripes* Burmeister could not be traced in the Halle Institute or the Berlin Museum but from the original description it is clear that Kirby's syononymy is correct. *Gryllus dorsalis* Thunberg was removed from the synonymy of this taxon and transferred to the genus *Anaeolopus* (Hollis, 1967). The type of *Epacromia rufostriata* Kirby, deposited in the BM(NH), differs from the lectotype of *tamulus* mainly in the form of the frontal ridge which in the former is very acute (Text-fig. 23). As this frontal ridge form is also displayed by specimens from Java and to a lesser extent by specimens from the Malayan mainland Kirby's species is here synonymized.

A specimen from Timor, identified by C. Willemse as *A. timorensis* n. sp. (MS), is atypical in that the colouration is generally much darker, the pale stripe along the costal area of the tegmen is reduced to two pale spots and the hind tibia is without the normal bluish band and is orange in the apical half. Morphologically however the specimen agrees in detail with *tamulus* and the present author considers there is insufficient evidence at present upon which to base a separate taxon.

*Type localities of synonymized species.*

*Gomphocerus tricoloripes* Burm. Type not located.

*Epacromia rufostriata* Kirby. Holotype ♂, Christmas Island (Indian Ocean), deposited in BM(NH).

Distribution (Text-fig. 84). From the five hundred and thirty specimens examined of this subspecies the following distributional conclusions were made:

INDIA, March to December; CEYLON, June, September to November, January; EAST PAKISTAN, July to August; NICOBAR IS., March; ANDAMAN IS., February to March, June, September; BURMA, May, August, October; THAILAND, February, May to August, October; CHINA, June, August to November; HAINAN, April to June; HONG KONG, October; TAIWAN, August; MALAYA, June to August, October, December through to January; SINGAPORE, January, May; SUMATRA, March, September, November; JAVA, September; LOMBOK, April; TIMOR, December; CHRISTMAS IS., (Indian Ocean), October, January to April; JAPAN, September, December;

Philippine Is., February to May, August, December; Mariana Is., January, May; Borneo, January; Brunei, June; Sabah, February, July, Celebes, June; New Guinea, March, August; Papua, March; Australia, January to March; Lord Howe Is., November.

### ***Aiolopus thalassinus dubius*** Willemse, 1923 **stat. n.**

(Text-figs. 24, 84, 97–102)

*Aeolopus dubius* Willemse, 1923 : 100.

Type locality. The species was described from several males and females from New Caledonia, Loyalty Islands and the New Hebrides. Efforts have been made to trace these specimens but only four females in the British Museum and a male and female in Willemse's collection were traced. Of these the following specimen is selected as a LECTOTYPE: ♂, Neukaledonen, Yate (*F. Sarasin* & *J. Roux*); it is deposited in the Maastricht Museum.

Differs from the nominate subspecies in the following ways:

♂. Fastigial foveolae rectangular and, at most, one and a half times longer than wide; frontal ridge very weakly sulcate (Text-fig. 24); prozona of pronotum often with weak lateral carinae between second and third transverse sulci. Phallic complex (Text-figs. 99–102) with basal valves of penis having rounded lateral expansions which are not recurved.

♀. Spermatheca as in Text-figs. 97–98.

General colouration dark brown with ochraceous and black markings; hind femur normally with inner area black with two incomplete pale bands; hind tibia black or dark brown on ventral and interno-ventral surfaces in apical two thirds; ochraceous costal stripe of tegmen complete.

Measurements (mm.). Length of body, ♂ 16·4–20·4, ♀ 22·2–28·8. Length of pronotum, ♂ 3·2–3·9, ♀ 3·8–5·0. Length of tegmen, ♂ 14·6–19·1, ♀ 18·7–23·3. Length of hind femur, ♂ 9·7–11·8, ♀ 12·2–15·3. Maximum width of hind femur, ♂ 2·4–2·9, ♀ 3·0–3·6. Maximum width of head, ♂ 2·7–3·2, ♀ 3·4–4·3.

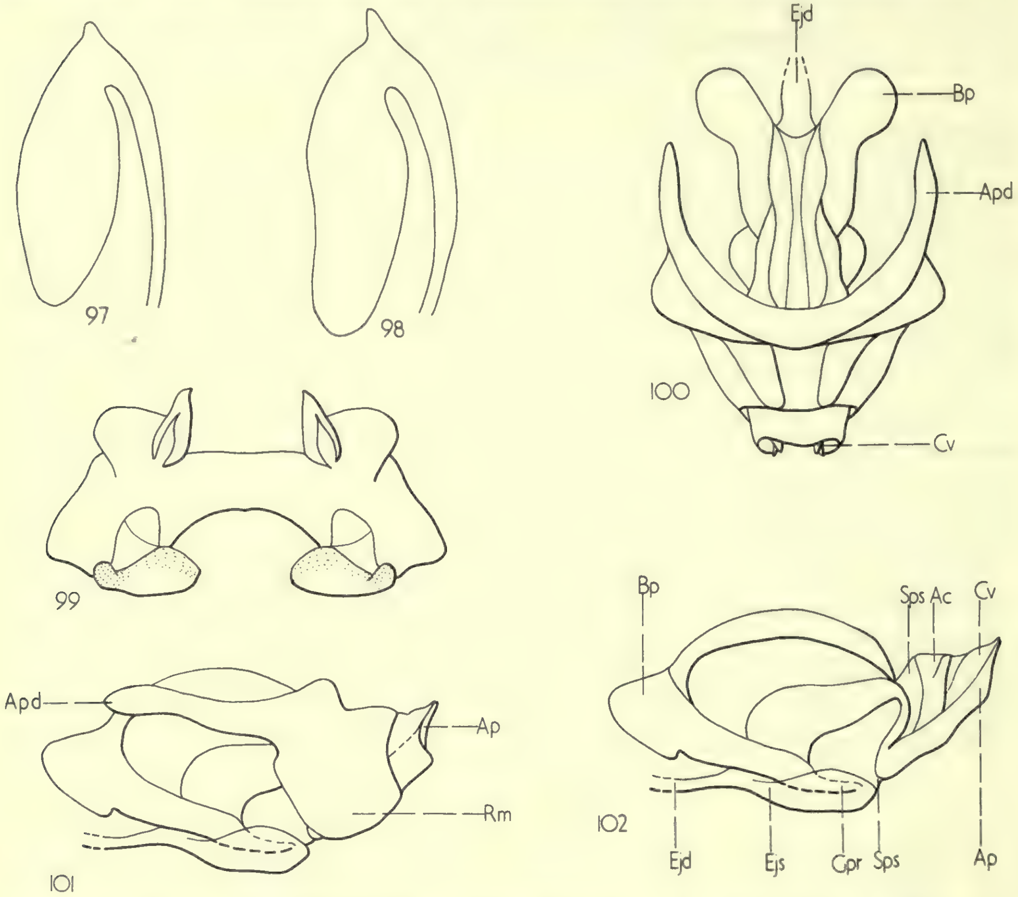
Ratios (twenty specimens of each sex measured):

| | P/C | | | FL/FW | | | E/P | | | E/F | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. | Min. | Ave. | Max. |
| ♂ | 1·10 | 1·19 | 1·32 | 3·96 | 4·10 | 4·21 | 4·42 | 4·78 | 5·17 | 1·43 | 1·54 | 1·62 |
| ♀ | 1·08 | 1·15 | 1·22 | 4·03 | 4·26 | 4·48 | 4·60 | 4·80 | 5·10 | 1·41 | 1·51 | 1·59 |

Discussion. This subspecies appears to be a culmination of a trend in the austro-oriental subspecies *tamulus* as displayed by Australian populations of the latter. The structure of the fastigial foveolae and frontal ridge in *dubius* is similar to that of Australian *tamulus* but the black colouration on the hind tibia in *dubius* serves for separation. To separate a subspecies on the basis of merely a colour difference may be regarded with suspicion, but as the separation is backed by the geographical distribution of the two forms in that *tamulus* is not found east of the Australasian region and *dubius* is restricted to the Polynesian region (Text-fig. 84) it seems reasonable to regard the two forms as separate taxa of subspecific status.

Distribution (Text-fig. 84). Two hundred and fifty-six specimens of this subspecies were examined and from these the following distributional notes were made:

NORFOLK Is., January to February; NEW CALEDONIA, May, July to September, November through to January; LOYALTY Is., no dates; NEW HEBRIDES, throughout the year; FIJI, April to May, October; FRIENDLY Is., February to March; SAVAGE Is., June; SAMOA, February to March, May, August to September.



FIGS. 97–102. *A. thalassinus dubius* (Willemse), genitalia. 97, ♀ spermatheca of specimen from Samoa; 98, same, of specimen from New Hebrides; 99, ♂ epiphallus; 100, ♂ phallic complex, dorsal view, epiphallus and ectophallic membrane removed; 101, same, lateral view; 102, ♂ endophallus, lateral view.

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# REVISION OF THE GENUS *CATASARCUS* SCHÖNHERR (COLEOPTERA: CURCULIONIDAE)

R. T. THOMPSON

BULLETIN OF
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BY

R. T. THOMPSON
(British Museum (Natural History))

*Pp.* 357–454; 1 *Plate,* 64 *Text-figures,* 4 *Maps.*

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# REVISION OF THE GENUS *CATASARCUS* SCHÖNHERR (COLEOPTERA: CURCULIONIDAE)

*By* R. T. THOMPSON

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## SYNOPSIS

*Catasarcus* Schönherr is an exclusively Australian genus. As here treated, it comprises 41 species and one subspecies. The latter, and 19 of the species are described as new. All, with one exception, are included in a key. Twenty-one species are figured (19 for the first time) and there are photographs of three others. All the types of previously described species (except one) have been located and checked and are formally cited.

Most species have small ranges and these are indicated, where known, by maps and lists of localities. Attention is drawn to the importance of accurate locality data in the study of flightless insects.

## INTRODUCTION

THE present work originated in an attempt to complete a revision of *Catasarcus* begun in 1955 by the late Sir Guy Marshall. His revision was far from completion and, as much additional material containing several undescribed species became available, it was decided to start the revision afresh.

Four of the species described here bear the manuscript names proposed for them by Marshall and this fact is stated in each case.

## HISTORY OF THE GENUS

*Catasarcus* was erected by Schönherr (1840) for four species described in this work by Fåhraeus and two described previously by Boisduval (1835) in the palaearctic genus *Cneorhinus* Schönherr, 1826. Further species were described by Boheman in Schönherr, 1845 (1); Germar, 1848 (1); Pascoe, 1870 (34); Blackburn, 1894 (2), 1896 (1); Lea, 1909*a* (4) and 1917 (1 var.). Numerous unpublished names occur on specimens examined by Chevrolat (in his own collection), Pascoe (in his own collection) and Marshall (in various museums). None of these names is quoted here. Discounting two names published in synonymy by Fåhraeus in Schönherr (1840), the total of available names is 50.

By 1931, when the genus appeared in *Coleopterorum Catalogus* (**114**: 7), five of these names had been placed in synonymy. Of these synonymies, one is here maintained, two are altered and two revoked. In the present work, a further 24 names are sunk (including the variety, which is also promoted to specific rank) and one is transferred to another genus. With the addition of 20 new names, there is a net decrease of three in the 1931 total.

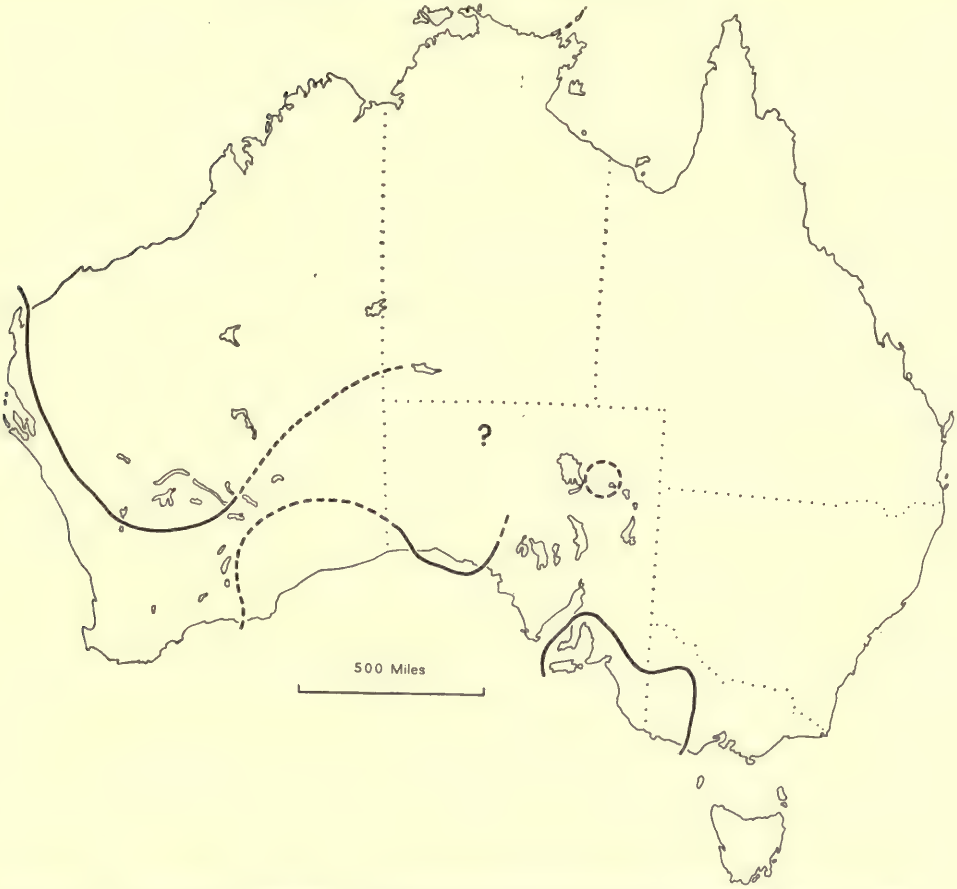
The genus has been redescribed by Labram and Imhoff (1848, No. 27), Lacordaire (1863 : 249) and Pascoe, whose revision of the genus appeared in 1870. The species were catalogued by Gemminger and Harold (1871 : 2311) and Masters (1872 : 217 and 1886 : 592). Lea (1897 : 590–600) published a series of observations, including a critical review of Pascoe's treatment of the quadrispinate species. He also included species of *Catasarcus* in various lists (1908 : 129, 1909*b* : 216, 1911 : 180). The genus was mentioned by Froggatt (1907 : 182) and Tillyard (1926 : 242). The name occurs in Heyne and Taschenberg (1908 : 226), in a key to the genera of Leptopiini by Heller (1923 : 148) and in a list of the Coleoptera described by Blackburn (Lea 1912 : xvii). As stated above, the genus appeared in *Coleopterorum Catalogus* in 1931.

## DISTRIBUTION

(Map 1)

The genus *Catasarcus* is confined to the mainland and certain off-shore islands of Australia. It occurs on Kangaroo I. and on several small islands near Perth. No species is known to occur in Tasmania, New South Wales or Queensland. There are two species and one subspecies in eastern Australia; the remainder occur in Western Australia, mostly south of Geraldton (29° S) but extending along the coast to North West Cape (22° S). Most of the species have restricted ranges but one (*C. armatus*) extends from Western Australia into both South Australia and the Northern Territory.

A glance at the maps showing the ranges of individual species (pp. 403, 450) and especially that showing the distribution of the two subspecies of *C. transversalis* (p. 380) will show how important precise locality data is in the study of flightless insects. The present revision has been severely hampered by the false and inaccurate data on many specimens. Lea's comment (1909*a* : 156) on specimens in European museums applies equally to Australian material. Some early specimens have no labels at all and the value of data such as 'Interior' is obvious. Apart from patently false localities, some recent labels are astonishingly vague, e.g. 'Everard Rgs., S.A. to Warburton Rgs., W. A.' (a distance of about 370 miles). In another case—' Central Austr./26.vi.1927/G. Horne '—proper data would have provided a second locality for one of the remotest and most interesting species.



Map 1. *Catasarcus*. Range. The Nullarbor Plain should be included (see p. 446).

## BIOLOGY

Very little has been recorded on the biology of the adults and the immature stages are virtually unknown, in spite of the fact that several species are common in well populated areas.

Records of adult host-plants are few and do not indicate which parts of the plant, if any, are attacked. A total of five families and nine genera, mostly of xerophytic trees and shrubs, is at present implicated, namely: *Leptospermum*, *Melaleuca*, ?*Eucalyptus* (Myrtaceae); *Jacksonia*, *Acacia* (Leguminosae); *Banksia*, *Hakea* (Proteaceae); *Casuarina* (Casuarinaceae) and *Xanthorrhoea* (Xanthorrhoeaceae). This range of families and the fact that three species of *Catasarcus* have been recorded from more than one host-plant family indicate a low degree of host-specificity.

The habit in many Curculionidae of dropping to the ground when disturbed, seems to be especially well marked in *Catasarcus*, a fact which should be borne in mind by collectors and which has been reported for *C. transversalis* by Tepper (1887 : 30) and by the late F. E. Wilson (personal communication). Wilson states: '. . . it will frequently drop to the ground from its resting place when one gets within a yard or two of it. When lying doggo, it is difficult to see on the greyish sand of its habitat '.

The eggs and young larvae of *C. asphaltinus* have been seen by Mrs. P. Sundstrom and a report of her observations is given under this species (p. 411).

## SOURCES OF MATERIAL

The following sources of material are indicated in the text by the symbols which precede them.

| | |
|---|---|
| A | Australian Museum, Sydney. |
| BM(NH) | British Museum (Natural History), London. |
| California | California Academy of Sciences, San Francisco. |
| CSIRO | C.S.I.R.O. Division of Entomology, Canberra. |
| Dresden | Staatliches Museum für Tierkunde. |
| FEW | F. E. Wilson, East Malvern, Victoria. (Mr. Wilson's collection is now in the National Museum of Victoria.) |
| FHUB | Dr. F. H. Uther Baker, Applecross, Perth. |
| Frey | Museum G. Frey, Tützing. |
| Macleay | Macleay Museum, University of Sydney. |
| Manchester | Manchester Museum, University of Manchester. |
| Munich | Zoologische Sammlung des Bayerischen Staates. |
| New York | American Museum of Natural History. |
| NSWAg | New South Wales Department of Agriculture, Rydalmere. |
| Oxford | Hope Department of Zoology (Entomology), University Museum, Oxford. |
| S | South Australian Museum, Adelaide. |
| Stockholm | Naturhistoriska Riksmuseum. |
| UW | University of Western Australia, Perth. (This material is now in the Western Australian Museum.) |
| V | National Museum of Victoria, Melbourne. |
| W | Western Australian Museum, Perth. |
| Washington | United States National Museum. |

## ACKNOWLEDGEMENTS

Among those who have sent me specimens for study I would like to thank especially Messrs C. Koch (W), A. Neboiss (V), G. F. Gross (S) and above all Dr. F. H. Uther Baker of Perth, who has not only made available to me his private collection but has sought diligently for further material, both in collections and in the field and has taken endless trouble to trace obscure localities. He has, to his great credit, collected no fewer than 23 species in the field, 13 of which are new.

My thanks are similarly due to Dr. P. B. Carne (CSIRO), A. M. Douglas (Perth), Dr. J. W. Evans (A), Dr. H. Freude (Munich), E. Gowing-Scopes (Halstead, England), my friend Dr. E. Haaf (formerly of the Frey Museum), Miss E. Hahn and Mrs. J.

Anderson (Macleay), Dr. R. Hertel (Dresden), the late Dr. W. D. Hincks (Manchester), Prof. Dr. J. O. Hüsing (Martin Luther Universität, Halle), the late Dr. E. Kjellander (Stockholm), Hugh B. Leech (California), Mrs. P. Sundstrom (Perth), E. Taylor (Oxford), Mrs. P. Vaurie (New York), J.-M. Vrydagh (Institut royal des Sciences naturelles de Belgique, Brussels), Miss R. E. Warner (Washington) and the late F. E. Wilson (East Malvern, Vict.).

I owe a special debt of gratitude to Dr. G. Kuschel of Nelson, N.Z. (late of Santiago, Chile) both for locating and studying the types of Boisduval on my behalf and for giving me help and encouragement at a critical stage in this study.

I am indebted to my senior colleague, Mr. J. Balfour-Browne for checking the typescript and making valuable suggestions. I also wish to thank Dr. E. B. Britton (now at CSIRO, Canberra) who collected some valuable material during a visit to Australia and my present colleagues R. D. Pope, Miss C. M. F. von Hayek, Dr. R. Madge and Dr. N. A. Aslam for their interest and advice.

I am very grateful to M. J. D. Brendell and Miss E. R. Tozer for testing the key.

The 21 figures of whole insects were executed by Mrs. C. A. O'Brien and Text-figs. 2–5 by Mr. Arthur Smith.

## ***CATASARCUS*** Schönherr

*Catasarcus* Schönherr, 1840 : 812.

Type-species: *Catasarcus bilineatus* Fåhraeus in Schönherr, 1840: 813, by original selection.

### Characters

Apterous Leptopiinae having a dorsal transverse furrow or impressed line near base of rostrum; frons with median longitudinal sulcus leading off from transverse rostral furrow and two or four longitudinal carinae; post-humeral region of elytra with a spine, tubercle or bulge (absent in individual specimens of some species).

Members of this genus also have the following characters in common:

Mandibles multisetose and usually partly squamose. Rostrum × 1–1·5 as long as broad; dorsal area flat with margins raised and median carina present, continuous with epistome. Antennal funicle with seven segments; scrobes lateral, linear, deep and oblique. Prothorax distinctly broader than long, with traces of two dorsal transverse striae, about equidistant from each other and the pronotal margins. Scutellum very small or obsolete. Metepisternal suture indicated at extreme anterior end only; posterior end dorsally with finger-like process projecting posteriad over metathoracic spiracle. Elytra without any swelling at shoulders but often with humeral tubercles; costal margin strongly sinuous. Intercoxal process of ventrite 1 truncate and almost twice as broad as a hind coxa; suture between ventrites 1 and 2 arcuate, deep at sides, becoming fine or obscure in mid-line; lengths of ventrites 3 and 4 subequal and together $\simeq$ 2. Legs with femora more or less claviform; tibiae with teeth along ventral (inner) margin, weakly mucronate at apex and with corbels enclosed; tarsi (especially segment 3) *all* larger in proportion to overall size in male than in female; claws free, but only weakly diverging, simple. Ovipositor strongly sclerotized and without styli.

The transverse furrow is represented by an impressed line in only one species, *C. memnonius*, in which it is also deflected posteriad in the middle and at the sides by processes from the rostrum; in all other species it is deeper and straight.

About a third of the species have prominent dorsal spines on the elytra. It is these species, with one exception, which have a large spine in the post-humeral region of the elytra. The exception is *C. albipectus*, which has long dorsal spines but only a very small tubercle or bulge behind the shoulder. The non-spiny species have either a large bulge often surmounted by a blunt tubercle, or a small, sometimes sharp tubercle, or a small and often indistinct bulge. In general, this post-humeral prominence lies in interstria 10 (between striae 9 and 10) in the non-spiny species but in interstria 9 in those with dorsal spines. It is interesting to note that in the latter group there is a gap in stria 9 below the spine and the strial punctures on each side are drawn upwards towards the base of the spine, as if the spine had emerged in interstria 10 and then forced its way through stria 9 into interstria 9. In the non-spiny species the tubercle is often closer to stria 9 than 10 and when large causes displacement or even interruption of stria 9. In the non-spiny *C. memnonius*, which is believed to have an affinity with the spiny species, the tubercle emerges about in the line of stria 9 as it also does in the spiny *C. albipectus* in which (as stated above) it is very small and so does not interrupt the stria.

The dorsal spines also cause gross distortion of the strial punctures on the disc, so that it is not always easy to decide in which interstriae the spines are situated. That the spines are not present as such in the pupa is suggested by a specimen of *C. spinipennis* in which, though subsequently fully hardened, the elytra failed to expand completely at eclosion; the anterior spines are absent and the distal half of each posterior spine is invaginated into the base. It is difficult to see how this condition could arise if the spines had been fully formed before eclosion.

Apart from *C. sericeus*, of which only five females have been seen, both sexes are known to occur in all species. The sex ratio usually approaches parity but males predominate in *C. albipectus*, *C. griseus* and possibly other species. In addition to having larger tarsi, the elytra in the male are usually slightly narrower and more evenly rounded, both above and at the sides, than in the female, though in species with globose elytra, they are similar or even slightly broader in the male. Ventrite 5 is usually less strongly convex in the male and weakly truncate and setose at the apex, whereas in the female it is entire. In some spiny species, the post-humeral tubercles are large in the female but very small or absent in the male.

## Spurious Characters used by previous Authors

The following characters were used solely, or principally, to distinguish the species indicated:

*Bleaching*: *C. stygmatipennis* (Boisd.); *C. ceratus* Pasc.; *C. pollinosus* Pasc.; *C. albuminosus* Pasc.

This is a curious condition which I have not encountered in any other genus. It is found in specimens which have suffered severe abrasion; not only are the scales and clothing setae missing but also the large setae of the legs and the corbellar fringes; in extreme cases, even the tarsal pads may be lost. The cuticle, whether black or red, becomes a uniform pale greyish colour with a waxy sheen. This effect is most pronounced on the more exposed surfaces; thus the underside, the frontal sulci and the strial punctures are often unaffected. The cuticle is not only bleached but softened and minor surface irregularities are smoothed out. If the soft layer is scraped off, firmer cuticle of the original colour is found beneath.

This condition is common in some species (e.g. *C. impressipennis*) but rare or unknown in others. Lea (1897 : 593–594) gives a good account of it and suggests that it may be caused by the weevils rubbing against comparatively hard leaves (*Banksia, Acacia,* etc.) since he observed that specimens from very soft-leaved plants were unaffected. Precisely how the effect is produced is unknown.

### *Extraneous Granules : C. capito* Pasc.; *C. furfuraceus* Pasc.

Described by Pascoe as 'sand-like exudation', these granules are resinous in nature; on gentle heating they melt and evaporate, leaving a tarry residue which, on stronger heating, leaves a whitish ash. They are insoluble in water, alcohol and benzene.

In the type specimens in question, they are very numerous and hence rather conspicuous but I have seen them in smaller numbers on specimens of several other species; they are often attached to the long setae on the tibiae. They are presumably derived from the plant on which the weevil lives.

### *Cuticle Thickness : C. mollis* Lea; *C. durus* Lea.

Lea first mentions this character in 1897 (: 599) and comments that it 'has been entirely overlooked by Mr. Pascoe'. As indicated in the discussion on p. 420 below, I regard this character as having little value. In this instance, Lea merely separated teneral and fully hardened specimens of the same species.

In addition to the above examples, a number of Pascoe's species are based on abnormal or defective specimens; these are discussed under the species concerned.

## Relationships

*Catasarcus* has no close relatives. The only form known to me which exhibits any of the major distinguishing characters of *Catasarcus* is an undescribed species and genus from the northern part of Western Australia.

At the same time, it has so far proved impossible to subdivide the genus. Several more or less distinct species-groups are apparent but the affinities of many species remain in doubt. Pascoe, in his revision, divided the genus according to the number of dorsal spines on the elytra. The present study shows that this character can be misleading. For example, *C. carbo* and *C. lepidus* are shown to be closely related, yet the former has four spines and the latter eight. Even as an artificial character the spines are not always reliable. A more useful character is afforded by the apex of the ovipositor which is laterally compressed or cylindrical in most spineless and quadrispinate species but dorso-ventrally flattened and blade-like in some multispinate species. Serious anomalies occur, however. Thus it is blade-like in the quadrispinate *C. marginispinis* but cylindrical in the apparently closely related *C. concretus* which has six dorsal spines; also, it is cylindrical in *C. murex* which has eight spines and flattened in *C. memnonius* which has none. Another important character, used successfully by Marshall in other groups, is the number of setae on the mentum. The ten species from *C. latheticus* to *C. longicornis* inclusive (except *C. carinaticeps*) have 6 or more setae, while most of the other species have only 4. But *C. carinaticeps* has 4 or 6 and both *C. azureipes* and *C. inaequalis* have 6 or more, though they are not closely related to the ten species, or to each other. It is worth noting, however, that the two species with only 2 setae on the mentum (*C. ustulatus* and *C. murex*) are each highly distinctive in other respects.

## Notes on Types

I have cited as holotypes those specimens which I have satisfied myself to be so, regardless of the manner in which they have been labelled or previously documented. I do not consider it necessary or advisable to designate uncited holotypes as lectotypes and I hope that those who do will accept my citations in lieu thereof. It has, however, proved necessary to designate one lectotype (for *C. humerosus* Pasc.) and one neotype (for *C. hopei* Fåhrs.).

The recognition of paratypes has sometimes proved difficult. In the case of Hope's material described by Fåhraeus, there are additional specimens of some of the species concerned both in Stockholm and in the Hope collection at Oxford. Although I have listed these specimens, I do not regard them as paratypes since the phrase ' Dom. Hope. Mus. Schh. ' indicates that the described specimens were retained in Stockholm and in any case the descriptions appear to have been based on the holotypes alone.

Pascoe frequently based his descriptions on a series of specimens (indicated by a range of lengths) but did not label the paratypes as such, so that they cannot now be distinguished from specimens acquired subsequently. Indeed, the presence of a determination label on a Pascoe specimen, other than the holotype, is a fair indication that the specimen is *not* a paratype. A further complication exists in Pascoe's case, owing to the fact that he examined A. Fry's material of *Catasarcus* about the time his paper was published and many Fry specimens named by Pascoe were labelled ' TYPE ' by Fry. Most of these specimens were obtained by Fry direct from du Boulay and were almost certainly seen by Pascoe after his paper was completed. Two of them, however, were obtained by Fry from Pascoe at this time and I have accepted these as paratypes (see p. 429).

## Terminology

The terms herein used are mainly those of Marshall, except that *segment* replaces *joint* and *interstria* is preferred to *interval*. The areas between successive strial punctures are *gaps*; these and the interstriae taken together are the elytral *interspaces*. The term *stria*, in relation to the elytra, is purely locational and does not imply the presence of an impressed line; where such lines are present, the striae are described as *impressed*.

To avoid confusion, the fifth tarsal segment is called the *claw segment* and abdominal sternites 3–7 are referred to as *ventrites* 1–5. In the males of some non-spiny species there is a fairly well defined depression on ventrite 1 behind each hind coxa; these are the *post-coxal cavities*.

In some species, the apex of the rostrum is abruptly expanded ventrally; this expansion is referred to as the *chin*, from its appearance in profile view (Text-fig. 8). On either side of the epistome, usually near the anterior margin, are its *flanking setae*. Any setae on the corbellar plate are called *adventitious setae* on account of their irregular appearance.

Scales are *sparse* when clearly separated from each other, *dense* when subcontiguous, *tessellate* when pressed together (without overlapping) so as to obscure completely the underlying cuticle and *imbricate* when they overlap strongly; they may be in close contact with the cuticle (*appressed*) or raised up from it (*loose*). The scales collectively, together with the clothing setae, constitute the *vestiture*.

The aedeagus is *terete* when subcircular in transverse section; its subterminal orifice is the *phallotreme*. The halves into which the apex of the ovipositor is divided are its *valves*.

Carinae, etc. are *arched* when convex in profile view. The frons is convex when the middle is higher than the sides but level longitudinally; when the middle is also arched, the frons is said to be dome-shaped. The term *triangular* denotes an equilateral triangle. The prefix *micro*- is applied to states or structures only clearly visible under a magnification of *c.* × 125.

Colours are described as they appear under a binocular microscope, using high voltage illumination and a bull's-eye condenser. Scales described as *bronzy* are brown with a metallic sheen.

## Identification

In addition to differences between the sexes (p. 364), many species exhibit great variation in size, sculpture and vestiture. Their appearance may also be altered by the presence of powdery exudate or as a result of bleaching (p. 364). At the same time, the differences between species may be slight or subtle so that correct identification by comparison *alone* is often impossible.

The various body proportions given in the key and descriptions were measured under a microscope using an eyepiece scale. The proportions of the prothorax and elytra are given with the length first, corrected to 10 in each case. This makes all the ratios comparable and avoids the use of figures less than unity for the elytral width. As the true elytral length is difficult to measure accurately, the line from the scutellum to the apex is used instead (see AC in Text-fig. 1). The proportions of antennal funicle segments 1–3 are given with 3 (the shortest) corrected to 1 in each case. These proportions vary considerably in each species, and mean figures, not ranges, are therefore given. The stated number of specimens from which the means are derived should be taken into account when comparing them with fresh data. The length of the rostrum was taken from the level of the anterior margins of the eyes to the longer of the two genae or the margin of the epistome if this were longer.

A very useful datum for identifying certain quadrispinate species is what I have called the *anterior spine index* (see Text-fig. 1). The measurements must be accurately made, using an eyepiece scale and taking care to incline the specimen so as to bring the points being measured into the same focal plane, thus ensuring true (maximum) readings. As the base of the spine is ill-defined, measurement AB is made to the centre of the nearest strial puncture; if there is no puncture near the line of measurement, the position is obtained by estimation. A table of these indices is given on p. 423.

The aedeagus is sometimes important in identification and should be examined wherever possible. Both the aedeagus and the ovipositor can, with care, be drawn out of a fully relaxed specimen with watchmaker's forceps without damaging the specimen, especially if they are allowed to remain *in situ*.

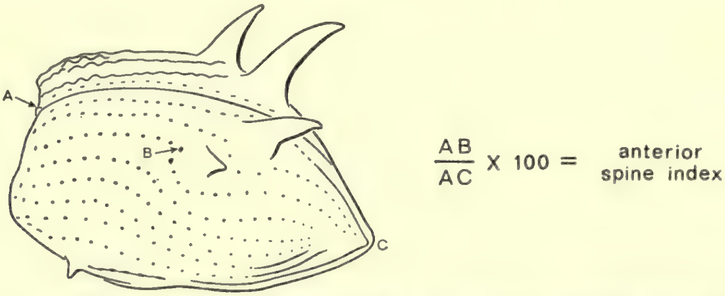


FIG. 1. *Catasarcus spinipennis* Fåhraeus ♂. Elytra, showing how anterior spine index is obtained.

As stated earlier, it is difficult to divide the species of *Catasarcus* into groups morphologically. Nevertheless, in the key to species I have attempted to group the non-spiny species according to the condition of the frontal carinae. This may make the couplets concerned difficult to interpret but it avoids bringing out all the species *seriatim*, which would make the key very tedious to use. To allow for variation in the carinae and other characters, several species have been brought out in more than one place. Some indication of the range of each species, where known, is given in the key; this will often serve to confirm determinations. Estimates of frequency would, for the most part, be meaningless but I have marked four species as '*Common*'; this is partly to prevent a wrong impression being gained from the fact that one of the four is new.

### KEY TO THE SPECIES OF *CATASARCUS*

(Except *C. albuminosus*)

1 Elytra with dorsal spines . . . . . . . . . . . . . 36

– Elytra without dorsal spines . . . . . . . . . . . . 2

2 (1) Head with 4 distinct longitudinal carinae on frons . . . . . . 4

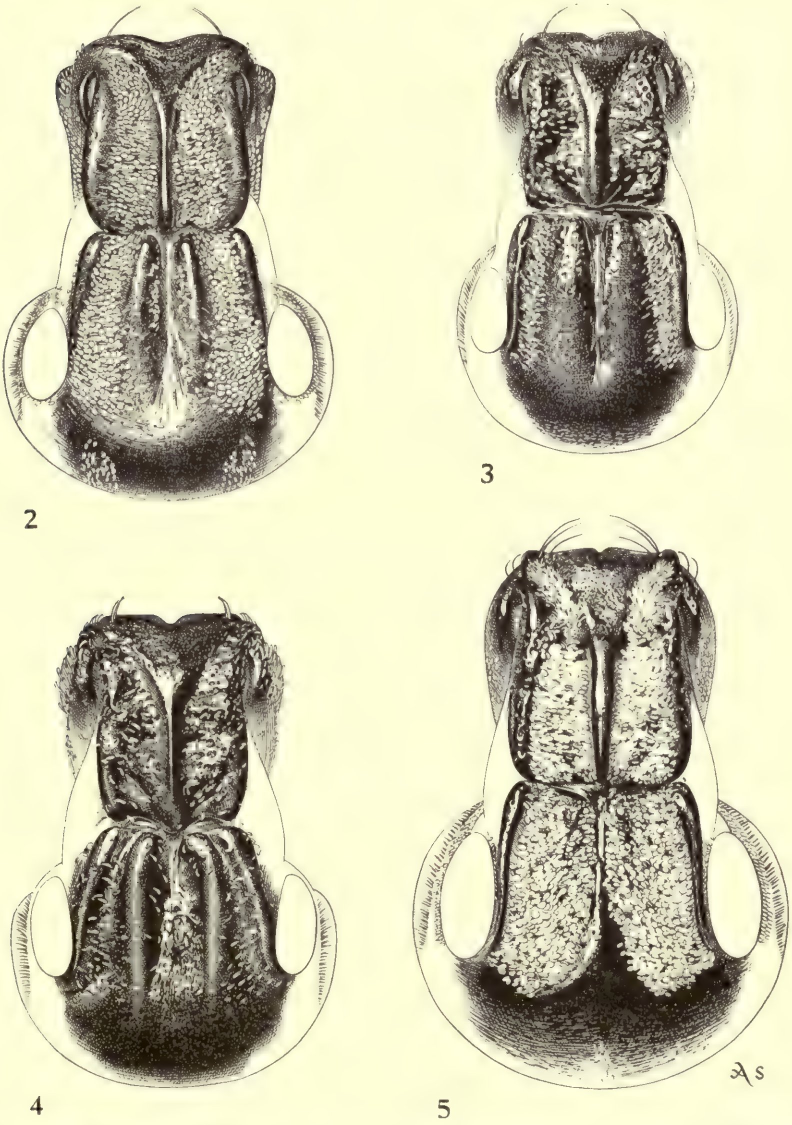
– Head without distinct frontal carinae . . . . . . . . . 3

3 (2) Frons convex, with median longitudinal cleft anteriorly; median rostral carina very strongly raised and projecting posteriad over the very short but deep transverse basal furrow; dorsum densely squamose. *W. A., near Busselton* **ustulatus** sp. n. (p. 388)

– Frons flat, with shallow median sulcus; transverse basal furrow similarly shallow: median rostral carina not strongly raised or projecting posteriad; dorsum bare. *S. A., east of Lake Eyre* . . **memnonius** Pascoe (p. 422)

4 (2) Frontal carinae all well developed, equidistant from each other and straight (or almost so) (Text-fig. 2); lateral carinae parallel or weakly converging anteriorly; (admedians often broader than laterals but then well separated by deep median sulcus); length rarely < 8 mm. *W. A., central and southern parts, east of Albany* . . . . . . . . . . . 5

– Frontal carinae either all poorly developed, or one pair differing markedly from the other in size, shape, or both (Text-figs. 3–5) (if not markedly different, then admedians closer to each other than to laterals) . . . . 8



FIGS. 2–5. *Catasarcus* spp. Head in dorsal view to show frontal carinae. 2, *C. obesus* sp. n. 3, *C. hopei* Fåhraeus. 4, *C. impressipennis* (Boisduval). 5, *C. opimus* Pascoe.

5 (4) Hind femora distinctly curving upwards near base (Text-fig. 10); pronotum with pair of small pale admedian scale-patches near anterior margin; scales on elytra mostly yellowish, on legs and underside of head bluish white with coppery reflection; rostrum not, or scarcely, longer than broad, epistome large and flat and making an acute angle with mentum. *Esperance area* ***varus*** sp. n. (p. 386)

– Hind femora almost straight in profile view (Text-fig. 11); pronotum without small pale spots; elytra variegated, or with mostly whitish scales; scales on underside of head whitish (rarely bright blue), without coppery reflection . 6

6 (5) Elytra elongate-ovate (10 : < 7); fore femora strongly swollen; legs with small vivid metallic blue or green scales, knees black; underside of head with narrow tract of pure white (or vivid blue) scales below eye. *Inland, north-east of Albany* . . . . . . . . . ***azureipes*** sp. n. (p. 385)

– Elytra subglobose (10 : > 7); fore femora normal; femora and underside of head with dense whitish scales throughout . . . . . . . . . 7

7 (6) Elytra with areas of yellow, white and grey scales forming an irregular pattern; strial punctures very regular, mostly pupillate; prothorax less strongly transverse (10 : < 18). *Wialki–Nulla Nulla area* . ***aspergetus*** sp. n. (p. 383)

– Elytra without yellow scales, strial punctures less regular, not pupillate; prothorax more strongly transverse (10 : > 18). *Southern Cross–Ravensthorpe area* . . . . . . . . . . . ***obesus*** sp. n. (p. 382)

8 (4) Admedian frontal carinae as long as lateral carinae, much closer to each other than to laterals and raised above them (if shorter, or not distinctly higher than laterals, then knees black and frons without any median elevation); humeral tubercle usually sharp, post-humeral tubercle smaller than humeral tubercle, or obsolete; interstriae smooth. *Esperance–Hopetoun area, inland to Widgiemooltha* . . . . . . . ***carinaticeps*** Lea (p. 400)

– Characters not so combined . . . . . . . . . . . . 9

9 (8) Admedian frontal carinae as long as, and distinctly broader than, the lateral carinae (Text-figs. 3, 4). *W. A.* . . . . . . . . . . . 10

– Admedian carinae otherwise . . . . . . . . . . . 20

10 (9) Hind femora distinctly curving upwards near base (Text-fig. 10); epistome clearly defined, triangular, flat or weakly convex. *Esperance area* ***varus*** sp. n. (p. 386)

— Hind femora almost straight in profile view (Text-fig. 11); epistome usually elongate or with disc depressed . . . . . . . . . . . 11

11 (10) Epistome elongate, merging gradually with median rostral carina in both dorsal and profile view; admedian frontal carinae and median rostral carina usually strongly raised, bare and shiny; antennae with funicle segments 4–7 scarcely longer than broad. *Albany and extreme south-west* . ***hopei*** Fåhraeus (p. 397)

— Characters not so combined . . . . . . . . . . . 12

12 (11) Prothorax twice as broad as long (♀); elytra in ♀ globose (Text-fig. 34), almost smooth; striae not, or weakly, impressed, punctures small (diameter often < ½ width of interstriae); scales fairly evenly distributed. *Tammin* . . ***sericeus*** Blackburn (p. 396)

— Prothorax less strongly transverse (10 : < 18); elytra less strongly inflated, often granulose-rugose; punctures larger (diameter at least = width of interstriae) or striae strongly impressed, or both; scales concentrated in depressions . . . . . . . . . . . . . . . 13

13 (12) Legs with tarsi black above (difficult to see when scales are dense). *Mainly north of Bunbury* . . . . . . . . . . . . . 14

— Legs unicolorous, red (sometimes very dark). *Mainly south of Bunbury* . . 17

14 (13) Antennae with funicle segments 5–7 not, or scarcely, longer than broad, club ovate; mentum with 4 setae; head with no broad scales below eye. *Around Perth* . . . . . . . . . **cygnensis** sp. n. (p. 412)

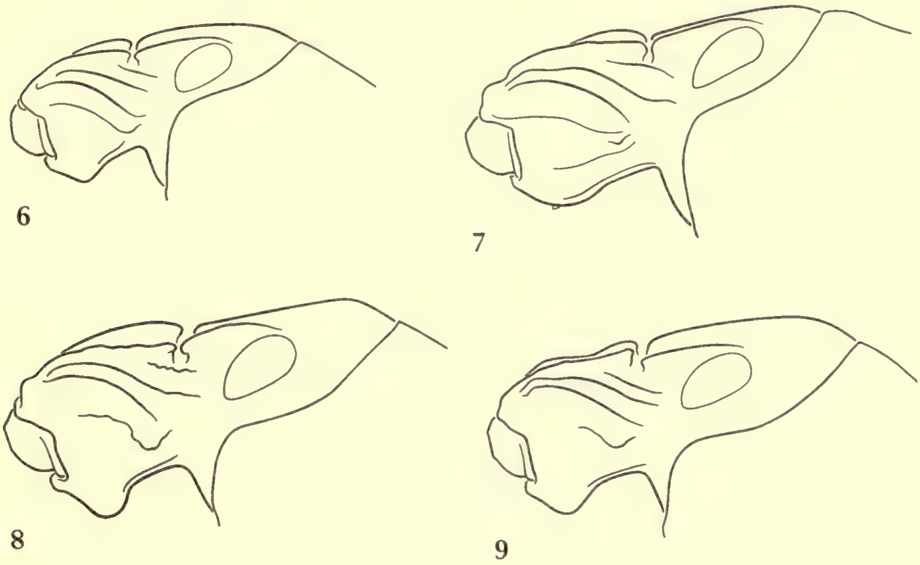
— Antennae with funicle segments 5–7 distinctly longer than broad, club fusiform; mentum with at least 6 setae . . . . . . . . . 15

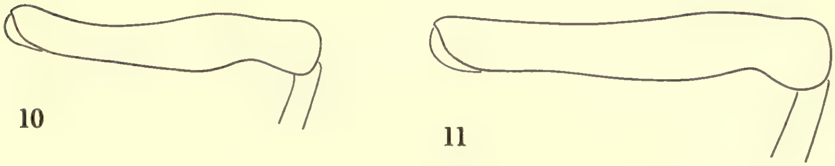
15 (14) Epistome merging with median rostral carina in profile view (ignoring any constriction between the two), convex; admedian frontal carinae as long as laterals and close together. *Hill River area* **pallidiventris** sp. n. (p. 406)

— Epistome weakly but abruptly declivous in profile view, flat . . . . 16

16 (15) Epistome with numerous (*c.* 8–10) flanking setae on each side; scales below eye usually narrow and separate; length < 19 mm. *Around Perth. Common* **asphaltinus** sp. n. (p. 407)

— Epistome with few (*c.* 4) flanking setae; scales below eye broader, contiguous or imbricate; length probably not > 14 mm. *Range uncertain* **longicornis** Pascoe (p. 411)





FIGS. 6–9. *Catasarcus* spp. Outline of head in profile view (antennae omitted). 6, *C. hopei* Fåhraeus. 7, *C. asphaltinus* sp. n. 8, *C. bilineatus* Fåhraeus. 9, *C. aerosus* sp. n.

FIGS. 10–11. *Catasarcus* spp. Outline of left femur in profile view. 10, *C. varus* sp. n. 11, *C. obesus* sp. n.

17 (13) Head with patch of scales below eye, admedian frontal carinae straight; dorsal area of rostrum with scales concentrated at posterior end. *Around Cape Naturaliste* ***coruscus*** sp. n. (p. 414)

— Head without, or with very small filiform scales below eye (not forming a patch); all frontal carinae usually more or less curved 18

18 (17) Elytra with interstria 7 about twice as wide as 6 (Plate 1, Figs. 3, 4). *Range unknown* ***inaequalis*** sp. n. (p. 421)

— Elytra with interstriae 6 and 7 subequal 19

19 (18) Prothorax with narrow tract of imbricate scales at sides, extending from anterior constriction to hind angle; elytra less elongate (♂, 10 : 6·5–6·7), interspaces convex and smooth. *Manjimup* ***laevior*** sp. n. (p. 417)

— Prothorax without imbricate scales at sides between anterior constriction and hind angle; elytra more elongate (♂, 10 : 5·8–6·5), interspaces flat and uneven or convex and weakly rugose. *Extreme south-west, mainly around Albany. Common* ***impressipennis*** (Boisduval) (p. 417)

20 (9) Post-humeral tubercle of elytra < segment 3 of antennal funicle, or represented by a smooth bulge, or absent 29

— Post-humeral tubercle > segment 3 of funicle; rostrum with distinct chin (Text-figs. 8, 9) 21

21 (20) Elytra with well marked sutural stripe of pale scales; rostrum with median carina raised, arched, bare and shiny; lateral frontal carinae narrow, parallel or weakly converging anteriorly; admedian carinae about half as long as laterals (often ill-defined). *W. A., west coastal region* 22

— Elytra rarely with any trace of a sutural stripe, lateral frontal carinae distinctly converging anteriorly 23

22 (21) Frons flat, epistome with numerous large flanking setae and smaller setae on disc; form more elongate (elytra in ♂ 10: 6·4–6·8); vestiture of pronotum uniform. *Wide area around Perth, inland to Beverley. Common* ***bilineatus*** Fåhraeus (p.393)

— Frons convex, epistome with 3–6 large adherent flanking setae and a similar number of much smaller, separate, setae mesal of these but scarcely any on disc; form less elongate (elytra in both sexes *c.* 10 : 7); pronotum with two broad, ill-defined pale stripes or admedian patches. *Moore River* ***latheticus*** sp. n. (p. 393)

23 (21) Post-humeral tubercle of elytra distinct but small (< segment 2 of antennal funicle) and sharp. *In or near Perth* 24

— Post-humeral tubercle large (> segment 2 of funicle) or represented by a large obtuse bulge; length seldom > 11 mm. 25

24 (23) Epistome with one tuft of adherent flanking setae (appearing as a single seta) on either side; dorsal area of rostrum narrow at base, usually progressively widening apically; median rostral carina depressed in middle (Text-fig. 9); lateral frontal carinae strongly converging anteriorly; legs slender, tibial teeth small. *Bejoording–Lancelin area* ***aerosus*** sp. n. (p. 390)

— Epistome with several separate flanking setae; dorsal area of rostrum usually distinctly narrower at apex than at base (sometimes lyre-shaped); median rostral carina usually level (sometimes depressed in middle); lateral frontal carinae less strongly converging anteriorly; legs stout, tibial teeth large. *Perth—Gingin area* ***griseus*** Pascoe (p. 391)

25 (23) Prothorax very strongly transverse (10 : > 24), sides almost straight, very strongly converging anteriorly (Text-fig. 31); elytra globose; antennae with segment 1 of funicle scarcely longer than 2. *W. A., around Esperance* ***bakeri*** sp. n. (p. 381)

— Prothorax less strongly transverse; funicle with segment 1 distinctly longer than 2 26

26 (25) Epistome narrow, flat, weakly arched and continuous with median rostral carina in profile view, with several recumbent squamiform or normal setae posteriorly. *Eastern Australia* . **transversalis anatolicus** ssp. n. (p. 380)

— Epistome broad, triangular, disc more or less depressed, bare . . . . 27

27 (26) Scales immediately in front of eye smaller and narrower than those below eye 28

— Scales immediately in front of eye similar or identical to those below eye; elytra with post-humeral tubercle very large and blunt or represented by a broad bulge, completely covered with scales; disc of elytra with weak transverse folds; scales mostly pearly but with heavy deposit of yellow-brown powdery exudate. *W. A., around Albany, inland to Borden* . **rugulosus** Boheman (p. 389)

28 (27) Form broader (elytra 10 : 7·2–8·1); elytra usually with strong continuous sinuous transverse folds; median rostral carina usually strongly raised and projecting posteriad over transverse furrow; epistome with 1 or 2 small flanking setae; setae on femora small dark and inconspicuous. *Eastern Australia* **transversalis** Germar (p. 377)

— Form less broad (elytra 10 : 6·8–7·3); elytra without, or with weak transverse folds; median rostral carina not strongly raised or projecting posteriad; epistome with several separate flanking setae; setae on femora large, pale and conspicuous. *W. A., Perth–Gingin area* . . . . **griseus** Pascoe (p. 391)

29 (20) *Mainly west of Albany* . . . . . . . . . . . . . 30

— *Mainly east of Albany* . . . . . . . . . . . . . 5

30 (29) Knees black, fore femora strongly swollen . . . . . . . . 31

— Knees red (sometimes infuscate or with black spots but never entirely black), fore femora swollen or not . . . . . . . . . . . 32

31 (30) Corbel tapering to a point at dorsal end; elytra finely granulate throughout, strial punctures ill-defined or irregular; ventrite 5 with transverse carina (sometimes obsolete in ♀); frons densely squamose (scales completely covering admedian carinae) and usually with a narrow wedge-shaped median carina (Text-fig. 5); pronotum coarsely granulo-rugose; femora sparsely squamose. *Between Perth and Geraldton* . . . . . . **opimus** Pascoe (p. 404)

— Corbel not tapering to a point dorsally; elytra without granules; strial punctures well defined, regular, picked out with white scales; all interspaces equally convex, forming a very regular reticulum (mesh pattern); frons less densely squamose; femora (at least in part) with vivid metallic blue or green scales. *Inland, north-east of Albany* . . . . . . **azureipes** sp. n. (p. 385)

32 (30) Median rostral carina depressed in middle (*not* at junction with epistome) (Text-fig. 9); post-humeral tubercle always present, sharp; lateral frontal carinae strongly converging anteriorly; length < 13 mm. *Bejoording–Lancelin area* . . . . . . . . . . . . **aerosus** sp. n. (p. 390)

— Median rostral carina level or arched; post-humeral tubercle often blunt or absent; lateral frontal carinae not, or weakly, converging anteriorly . . 33

33 (32) Epistome with numerous (*c*. 8–10) flanking setae on either side, poorly defined, flat and weakly but abruptly declivous; interstriae of elytra flat or weakly convex, rugose; apex of elytra in male finely rugose, appearing shrivelled. *Wide area around Perth. Common* . . . . **asphaltinus** sp. n. (p. 407)

— Epistome with 2–4 flanking setae . . . . . . . . . 34

34 (33) Frons flat, admedian frontal carinae completely covered with loose imbricate scales; centre of frons usually with very narrow cariniform elevation which widens posteriorly and merges with vertex. *Toodyay–Merredin area* **frontalis** sp. n. (p. 402)

— Frons weakly convex, admedian frontal carinae not completely covered with scales; centre of frons without any cariniform elevation . . . . 35

35 (34) Epistome convex, merging with median rostral carina in profile view (ignoring any constriction between the two); scales in front of eye *c.* × 2·5–5 as long as broad, < half as wide, on average, as scales below eye; size and form as in *C. asphaltinus*. *Hill River* . . . . . **pallidiventris** sp. n. (p. 406)

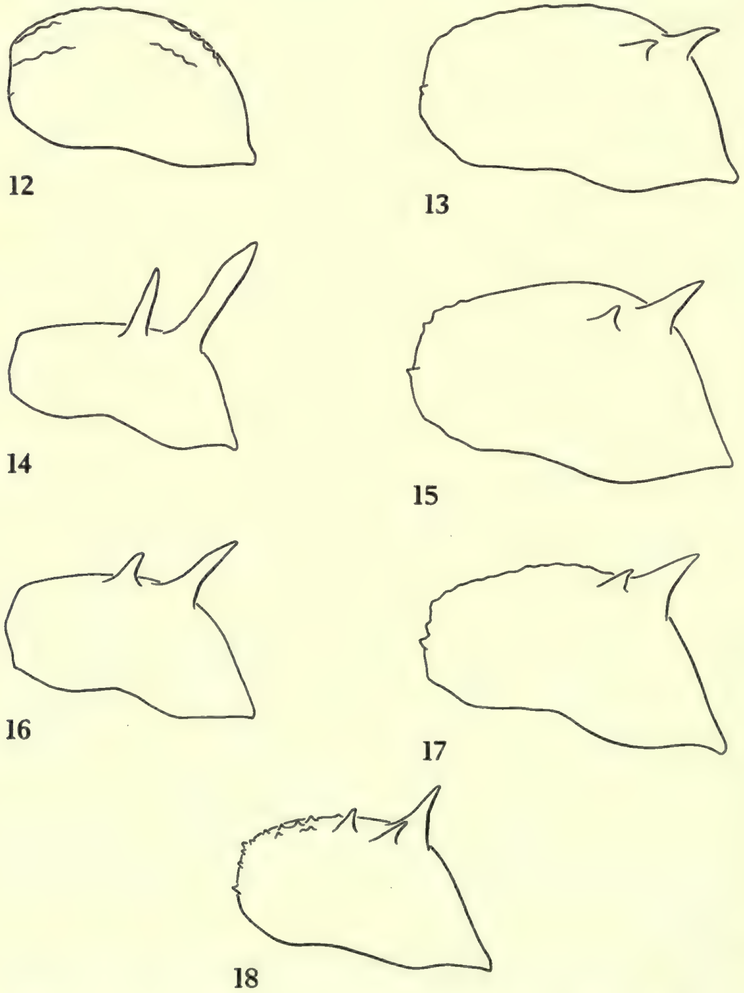
— Epistome flat, weakly but abruptly declivous; scales in front of eye × 1·5–3 as long as broad, on average > half as wide as scales below eye; length probably not > 14 mm. *Range uncertain* . . . . **longicornis** Pascoe (p. 411)

36 (1) Elytra with 6 or more dorsal spines or large tubercles (Text-figs. 18–22) . . 47

— Elytra with fewer than 6 dorsal spines (Text-figs. 13–17, 23). *W. A.* . . 37

37 (36) Pronotum dark red, head and elytra black. *West coast, north of Geraldton* . 38

— Pronotum black or brown, concolorous with head and elytra . . . 39



FIGS. 12–18. *Catasarcus* spp. Outline of left elytron in profile view. 12, *C. memnonius* Pascoe ♂. 13, *C. intermedius* Pascoe ♀. 14, *C. albipectus* sp. n. ♂. 15, *Idem* ♀. 16, *C. echidna* Pascoe ♂. 17, C. *spinipennis* Fåhraeus ♀. 18, *C. concretus* Pascoe ♂.

38 (37) Form more elongate (prothorax 10 : 14·7–16·7, elytra 10 : 6·8–7·6); ♂ with posterior dorsal spines very long and cylindrical (Text-fig. 14), post-humeral spine represented by a small sharp tubercle, or obsolete; disc of elytra without discrete scale-patches. *Murchison River Reserve* . **albipectus** sp. n. (p. 425)

— Form less elongate (prothorax 10 : 16·5–17·3, elytra 10 : 7·4–8); both sexes with dorsal elytral spines tapering throughout their length; post-humeral spine normal; disc of elytra with discrete, but irregular, scale-patches. *Between Geraldton and Murchison River* . . . . . . **bicolor** sp. n. (p. 427)

39 (37) Corbels squamose; eyes round (× 1·2 as long as broad), very strongly convex, completely encircled with white scales; disc of pronotum very strongly rugose, with impressed median line. *Geraldton—Shark Bay area* **carbo** Pascoe (p. 447)

— Corbels without scales; eyes more elongate, less strongly convex, not, or incompletely, encircled with white scales; disc of pronotum less strongly rugose than sides . . . . . . . . . . . . . . 40

40 (39) Dorsal elytral spines black . . . . . . . . . . 41

— Dorsal elytral spines red or dark red . . . . . . . . . . 42

41 (40) Head with lateral frontal carinae absent, admedian carinae very small, tuberculiform; usually each dorsal elytral spine ascended by a tract of pale scales. *Bejoording–Lake Grace area* . . . . **marginispinis** Pascoe (p. 436)

— Head with lateral frontal carinae distinct; dorsal elytral spines bare or with uniform small dark scales. *Around Geraldton* . . **echidna** Pascoe (p. 428)

42 (40) Elytra with interstriae 2 and 3 each with a small sharp shiny forwardly-projecting tubercle at base (projecting beyond base), vestiture brown with a pale flash at sides; prothorax transverse but barrel-shaped. *?Geraldton area* **cicatricosus** Pascoe (p. 440)

— Elytra without, or with different tubercles at base . . . . . . 43

43 (42) Corbels densely setose (> 20 setae on plate); transverse rostral furrow shallow; post-ocular lobes of prothorax rather sharply angulate; antennal club short and stout (2 : 1); dorsal elytral spines small (anterior pair sometimes obsolete) and set further back (Text-fig. 13). *Between Carnarvon and North West Cape* . . . . . . . . . **intermedius** Pascoe (p. 424)

— Corbels with < 20 adventitious setae; transverse rostral furrow deep; post-ocular lobes not, or weakly, angulate; antennal club more elongate; dorsal spines, on average, larger and set further forward on elytra . . . 44

44 (43) Prothorax subcylindrical (10 : < 16); scales forming a black and white pattern (Text-fig. 58) (dorsal elytral spines red). *?Geraldton area* **albisparsus** Pascoe (p. 436)

— Prothorax much broader at base than at apex (10 : > 16); scales, if white, not forming a pattern . . . . . . . . . . . . . 45

45 (44) Elytra with anterior dorsal spines evidently nearer base in ♂ than in ♀; base of interstria 3 with large smooth shiny callus or large granule; head with lateral frontal carinae usually extending over top of eye. *Around Geraldton* **echidna** Pascoe (p. 428)

— Elytra with dorsal spines not evidently nearer base in ♂ than in ♀, base of interstria 3 simple or, if with large granule, then several other similar but smaller granules present in humeral region; head with lateral frontal carinae stopping short before eye (and often obscured by scales) . . . . 46

46 (45) Aedeagus with transverse wrinkles below phallotreme; majority of scales on tarsi brown (with metallic reflections); elytra typically with patches of pearly or coppery scales on a dark background and usually without granules. *Perth–Hill River area* . . . . . . . . **nephelodes** sp. n. (p. 431)

— Aedeagus without any wrinkles below phallotreme; majority of scales on tarsi whitish or pearly; elytra typically with large whitish scales throughout and often granulose. *Perth area, including off-shore islands, north to Yanchep, south to Pemberton. Common* . . . . **spinipennis** Fåhraeus (p. 443)

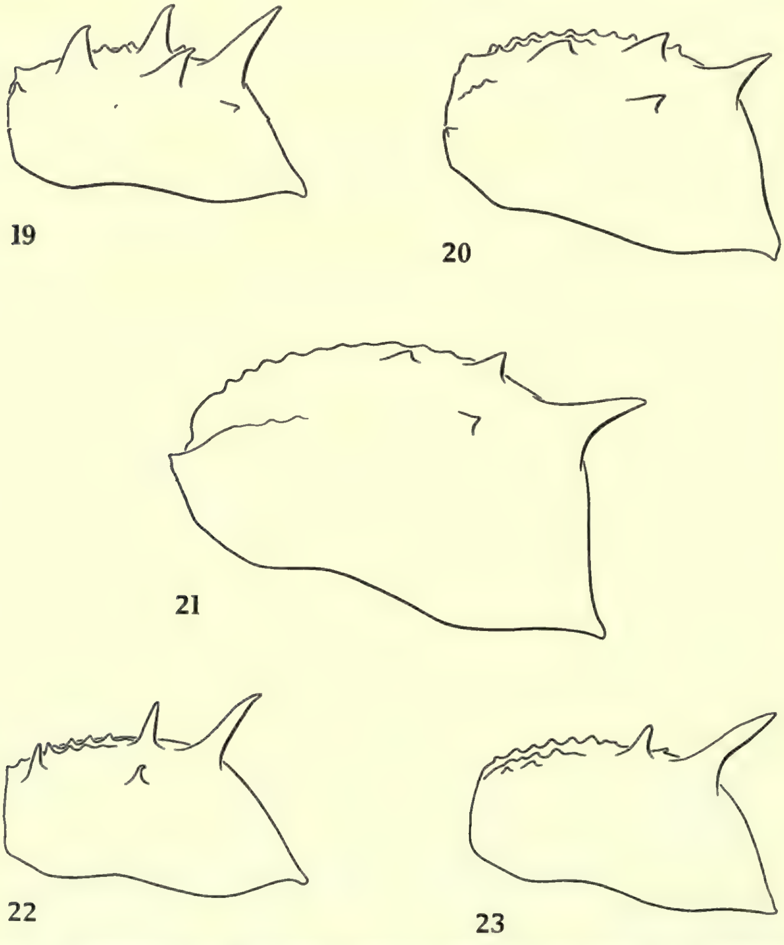
47 (36) Head with lateral frontal carinae distinct; each elytron with 1 large spine at top of declivity and 3 smaller spines (very small in ♀) on disc (Text-fig. 21); humeral tubercle large in ♀, absent in ♂. *Kalgoorlie, W. A., to Fowler's Bay, S. A., inland to Ayer's Rock, N. T.* . . . . **armatus** Blackburn (p. 443)

— Head with lateral frontal carinae indistinct or absent. *W. A.* . . . . 48

48 (47) Prothorax dark red; eyes × 1·5 as long as broad, very weakly convex; each elytron with 4 large dorsal spines, including one in interstria 4 between middle and base (Text-figs. 19, 20). *Bridgetown–Lake Grace area* **murex** sp. n. (p. 441)

— Prothorax concolorous with head and elytra; eyes < × 1·3 as long as broad, moderately to very strongly convex; elytral spines otherwise . . . . 49

49 (48) Corbels squamose; pronotum more strongly rugose on disc than at sides, anterior border with bifid median swelling; elytra without a small sharp tubercle at base of interstria 3 . . . . . . . . . . . . . 50



FIGS. 19–23. *Catasarcus* spp. Outline of left elytron in profile view. 19, *C. murex* sp. n. ♂. 20, *Idem* ♀. 21, *C. armatus* Blackburn ♀. 22, *C. lepidus* Pascoe ♂. 23, *C. carbo* Pascoe ♂.

— Corbels without scales; pronotum less strongly rugose or granulate on disc than at sides, anterior border not swollen; elytra with a small sharp tubercle at base of interstria 3, projecting anteriad beyond base. *Hopetoun* **concretus** Pascoe (p. 435)

50 (49) Eyes very strongly convex, broadly encircled with white scales; each elytron with 2 large dorsal spines posteriorly (Text-fig. 23). *Geraldton–Shark Bay area* **carbo** Pascoe (p. 447)

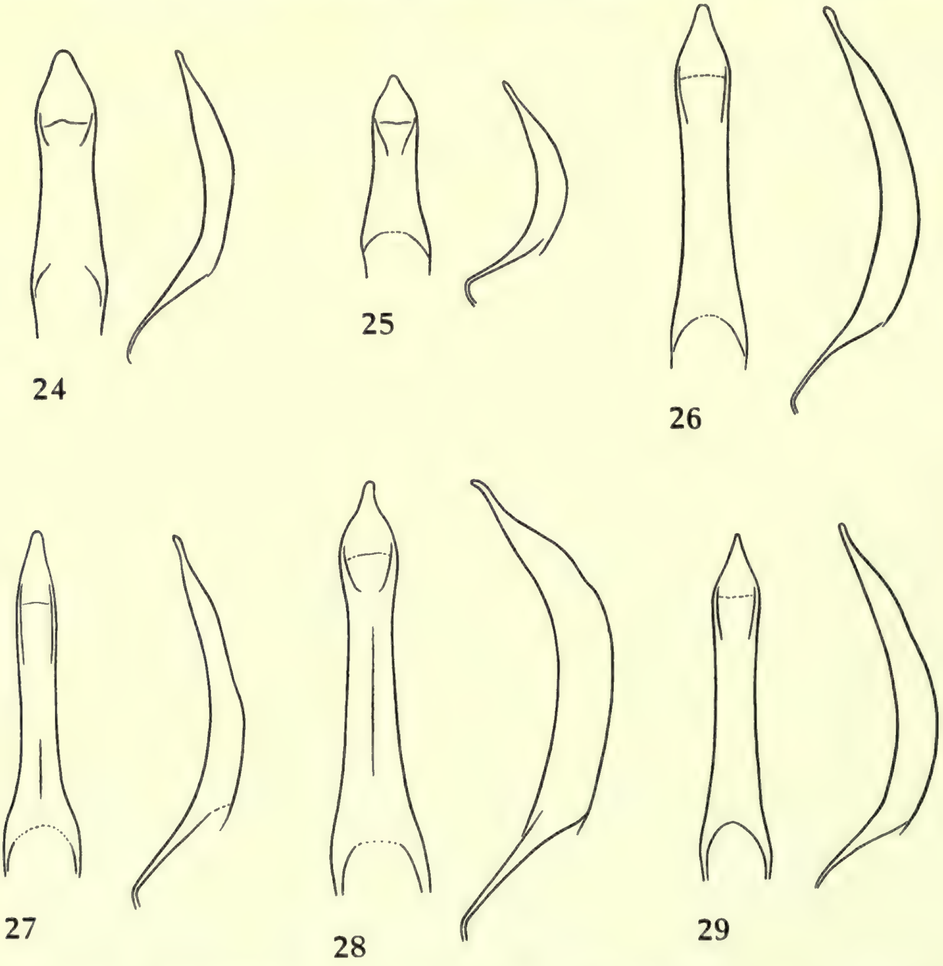
— Eyes less strongly convex, not, or very narrowly, encircled with white scales; each elytron with 3 large dorsal spines posteriorly and one near base, in interstria 5 (Text-fig. 22). *Range uncertain* . . **lepidus** Pascoe (p. 446)

## ***Catasarcus transversalis*** Germar **sp. rev.**

(Text-figs 24, 30, Map 2)

*Catasarcus transversalis* Germar, 1848 : 212.
*Catasarcus transversalis* Germar; Taschenberg, 1869 : 31.
*Catasarcus transversalis* Germar; Lacordaire, 1863 : 250 (note).
*Catasarcus transversalis* Germar; Pascoe, 1870 : 16, 25, 26.
*Catasarcus transversalis* Germar; Tepper, 1887 : 30.
*Catasarcus stigmatipennis* (Boisduval); Lea, 1918 : 265 [Erroneous synonymy].

Length 7·4–11·4 mm. Body black, legs and antennae dark red to black. Scales dense but easily abraded, mostly whitish, usually with pink of green reflection (rarely coppery); setae brown throughout; powdery exudate scanty or absent. *Head* with frons weakly to distinctly convex; frontal carinae very variable, laterals short, straight, subparallel to strongly converging anteriorly (rarely almost obsolete); admedian carinae straight or weakly curved, parallel with laterals or more strongly converging anteriorly, about equidistant from each other and from laterals, occasionally irregularly subdivided or with accessory carinulae; frons in mid-line even or with smooth elongate tectiform or rounded elevation; scales dorsally fairly dense and recumbent, mainly white on frons and olive-green on vertex (dense behind eyes) but white scales sometimes restricted to two ill-defined admedian tracts or a pair of dense patches just behind level of hind margins of eyes; scales below eyes pearly white, imbricate, becoming less dense towards mid-line. *Rostrum* × 1·1–1·2 as long as broad, distinctly widening apically; epistome broad with shallow discal depression accentuated by very low transverse subapical elevation, surface pitted and strongly microreticulate anteriorly, flanking setae as in *C. rugulosus* but one or two smaller setae near them and two more in median excision; median carina sharp, narrow in front becoming broader and tectiform behind and there moderately to very strongly raised (and often arched) and projecting strongly over the very deep transverse furrow with an oblique carina supporting the projection on either side; dorsal area rectangular to lyre-shaped, lateral sulci sometimes deep; sparsely to densely squamose throughout. *Antennae* with lengths of funicle segments 1–3 in ratio 2 : 1·5 : 1 (mean of seven), 4–6 slightly shorter than 3, subequal, 7 ≏ 3 and about × 1·3 as long as broad. *Prothorax* very strongly transverse (10 : 19·3–23·9), broadest in basal half, sides rounded, strongly converging anteriorly; post-ocular lobes fairly well developed; upper surface smooth to obscurely granulate, sides distinctly to strongly granulate; transverse striae strongly impressed, usually complete but often irregular; scales below and at sides dense, often partly imbricate; scales above less dense (sometimes very sparse) but usually with small pale spot on posterior stria at either side and pair of admedian patches, also on posterior stria as in *C. rugulosus* (but less well defined). *Scutellum* smooth, punctured, with variable number of elongate and filiform scales. *Elytra* shortly ovate-acuminate, globose in some females (10 : 7·2–8·1); humeral tubercle basal, well developed, forwardly directed and sharp in female, blunt or obsolete in male; interstriae 2, 3 and 5 often slightly raised at base; post-humeral tubercle large, conical or subparallel-sided, blunt, strongly reflexed ventrad and sometimes posteriad; striae impressed throughout; strial punctures large and deep near sides, becoming smaller towards suture; interstria 1 sometimes flattened and depressed on disc, otherwise elytral interspaces strongly raised, forming a reticulate pattern or, more often, a series of high sinuous undulating transverse folds, mostly continuous across full width of each elytron; scales very dense on interstriae 9 and 10 (except underside of post-humeral tubercle) and on interstria 1 when depressed, elsewhere less dense and fairly uniform but transverse folds often bare or with inconspicuous brown scales which may predominate on declivity. *Legs* rather slender; femora scarcely swollen; fore and middle tibiae very weakly curved, with moderate teeth; hind tibiae straight, with unequal teeth, corbels narrow with nought to many adventitious setae; femora usually with dense large round scales ventrally and at apex and sparse small elongate scales elsewhere (sometimes with large scales throughout); tibiae and tarsi with dense, mainly brown scales throughout. *Underside* densely squamose; ventrites 1 and 2 with small scattered granules, strongly raised and bead-like, especially in male; post-coxal cavities linear or obsolete; suture between ventrites 1 and 2 distinct throughout its length. *Aedeagus* (Text-



FIGS. 24–29. *Catasarcus* spp. Aedeagus in dorsal and lateral view. 24, *C. transversalis* Germar. 25, *C. bakeri* sp. n. 26, *C. obesus* sp. n. (Lake Carmody). 27, *C. rugulosus* Boheman. 28, *C. griseus* Pascoe. 29, *C. varus* sp. n.

fig. 24) short, depressed, rather strongly curved, terete, smooth, except for numerous fine scattered granules on underside of apex; apical region short, tip broadly rounded, not usually deflexed. *Ovipositor* with valves somewhat depressed, together broader than high but each smoothly rounded and not at all explanate.

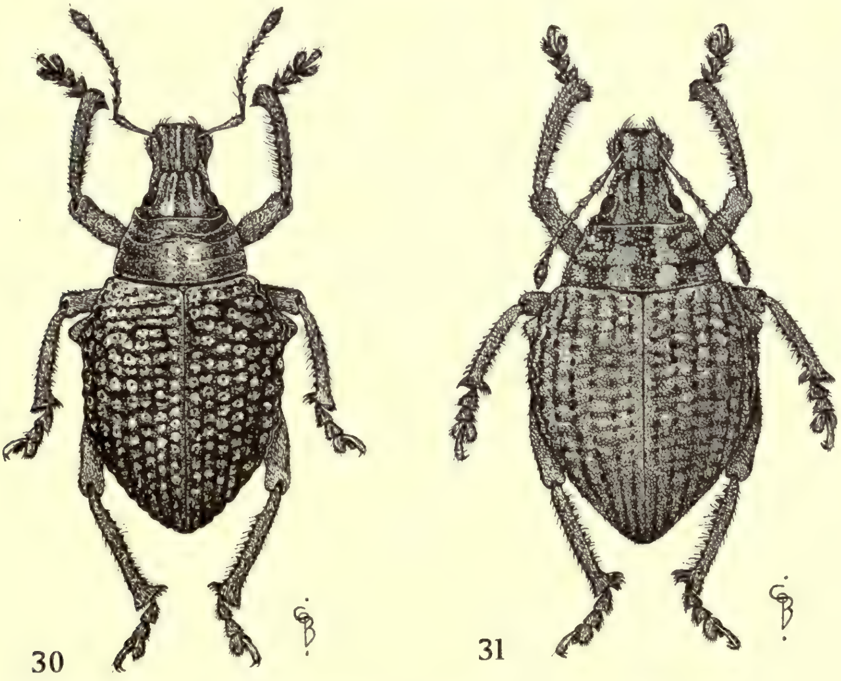
Holotype ♂, Adelaide, [1844–45 (*H. H. Behr*)], in Zoologisches Institut, Martin Luther Universität, Halle. Unique (see Taschenberg, 1869 : 31).

Over 130 specimens seen.

Localities: South Australia: Kangaroo I. (Kelly's Hill Caves); Yorketown; Adelaide; Victor Harbour; Gawler; Nuriootpa; Barossa; Murray Bridge; Tintinara; Lucindale. Victoria: Yanac; Kiata; Gypsum. See map 2.

A record for Newcastle, N.S.W. (Frey) is known to be false and a specimen from the Pascoe collection (BM (NH)) with ' Champion B. ' must also be wrongly labelled. A recent record for Alice Springs, N.T. (xii.1955, *W. B. H*[*itchcock*]) (V) must, if genuine, almost certainly be a transported specimen.

Host-plants: *Hakea rostrata* (Tintinara, 6.i.1887 (*Tepper*) (A)). Further host-plants are mentioned by Tepper (1887 : 30) with other interesting observations: ' *Catasarcus transversalis*, Germar, is one of the commonest beetles in the scrub during spring and summer . . . The beetles feed on the leaves of various kinds of Leptospermum, Melaleuca (tea-trees) and shrubs. When alarmed they drop down at once '. The last observation is also reported by Wilson (p. 363, above).



Figs. 30, 31. 30, *C. transversalis* Germar ♂. 31, *C. bakeri* sp. n. ♀.

Lea's erroneous synonymy of this species with *C. stygmatipennis* is discussed on p. 420. In spite of some misgivings, Pascoe identified this species correctly.

The nominate subspecies, described above, can usually be distinguished from all other forms by the strongly raised, sharp, beak-like median rostral carina and the very strong transverse folds on the elytra.

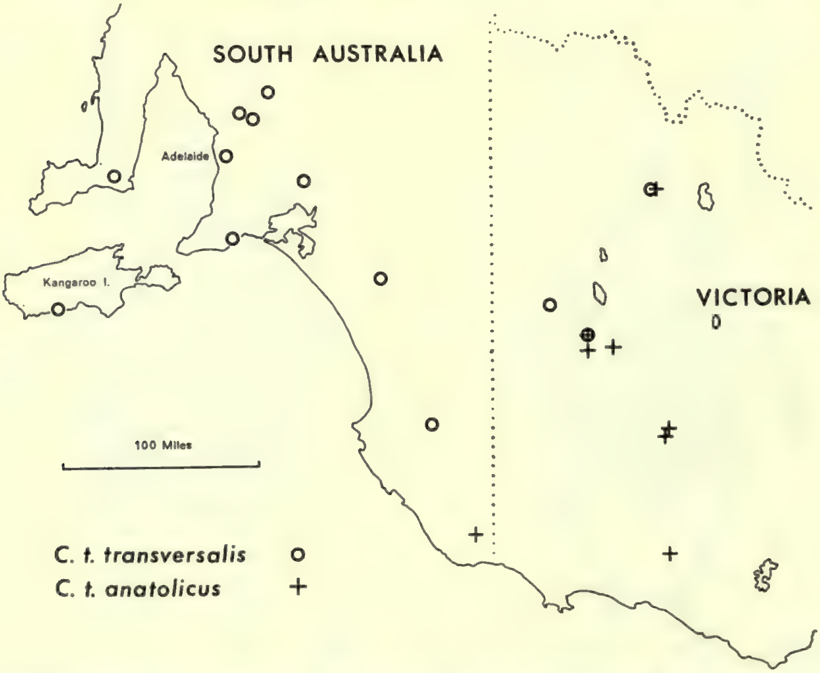
### *Catasarcus transversalis anatolicus* ssp. n.

(Map 2)

Length 7·3–10 mm. Distinguished from the nominate subspecies as follows. *Head* with admedian frontal carinae usually closer to each other than to laterals, median sulcus often reduced to a short cleft (frons then dome-shaped). *Rostrum* with epistome usually longer than broad, flat, arched, seldom with any subapical elevation, disc with a small number of squamiform setae posteriorly and not well defined from median carina which is evenly and less strongly raised. *Prothorax* slightly less transverse (10 : 18·5–20·6); transverse striae less strongly impressed (anterior often obsolete); scaling more uniform. Elytra with weaker transverse folds, often smooth or regularly granulate with strongly impressed striae. *Legs* almost always quite black; femora densely squamose throughout. *Aedeagus* as in *C. t. transversalis* except that both specimens examined have dorsal margins carinate almost to base.

Holotype ♂. VICTORIA: Warnambool, Teatree Creek, 9.x.1964, in the National Museum of Victoria, Melbourne.

Paratypes. 2 ♂, Grampians (det. Lea, vii.1904) (V); 1 ♀, same locality, 1934; 2 ♂, Hall's Gap (all *K. Guichard*) (all Manchester); 1 ♀, Kiata, 29.xii.1918 (*F. E.*



MAP 2. *Catasarcus t. transversalis* Germar and *C. t. anatolicus* ssp. n. Distribution.

*Wilson*) (A); 1 ♀, ditto but 31.xii.1918 (FEW); 1 ♂, ditto but 23.xi.1952 (BM (NH)); 1 ♂, Little Desert, 9 mls. S. of Kiata, x.1948 (*A. Musgrave*) (A); 1 ♂, 2 ♀, Little Desert, 17–25.x.1952 (*E. M*[*atheson*]) (2 V, 1 BM(NH)); 1 ♀, same locality, 23.x.1946 (*A. B*[*urns*]); 1 ♂, Gypsum (*C. Oke*); 1 ♂, Dimboula (all V); 1 ♂, 1 ♀, without data (V); 1 ♂, Mount Gambier, 29.x.1957 (*W. M. M*[*oore*]); 1 ♀, ditto but 1.xii.1957 (both V); 1 ♂, 1 ♀, ' S. Australia ' (BM(NH), V). Total: 22 specimens.

Localities: SOUTH AUSTRALIA: Mount Gambier. VICTORIA: Kiata; Little Desert; Dimboula; Gypsum; Grampians; Hall's Gap; Teatree Creek (near Warnambool). See Map 2.

In the specimen from Dimboula and one of those from Kiata, the elytra have a high proportion of golden scales, especially at the base and along interstria one (the suture). In some other specimens, notably those from Mount Gambier, there is a heavy deposit of yellow powdery exudate.

The most easterly representative of the genus. The ranges of the two subspecies appear to meet and possibly overlap in the region of the Little Desert. They were taken together at Kiata in 1918 and have both been taken at Gypsum (on separate occasions). The nominate subspecies was also taken in the Little Desert (without precise location) by W. van der Starre in 1964 (FHUB, BM(NH)).

### ***Catasarcus bakeri* sp. n.**

(Text-figs. 25, 31, Map 4)

Length 6·2–9·1 mm. Body black, legs and antennae dark red to black. Scales dense, mostly whitish or pearly; setae brown throughout; no powdery exudate observed. *Head* with frons as in *C. rugulosus*; scales large and dense throughout, imbricate below eye, mostly white or pearly but usually brown on vertex; eyes almost flat, suboblong, × 1·5 as long as broad. *Rostrum* × 1·1–1·3 as long as broad, distinctly widening apically; epistome smaller than in *C. rugulosus*, disc flat, more coarsely pitted and often without evident microsculpture; two (apparently one) flanking setae; median carina narrow, often depressed in middle; dorsal area rectangular or broadest at junction with upper margin of scrobe; chin fairly well defined, sharp; rather densely squamose throughout. *Antennae* with lengths of funicle segments 1–3 in ratio 1·7 : 1·5 : 1 (mean of five), 3–7 subequal (3 and 7 usually longest). *Prothorax* very strongly transverse (10 : 24·3–26·3), broadest at base, sides almost straight, very strongly converging anteriorly; post-ocular lobes poorly developed; upper surface smooth, with a few scattered punctures but no granules; sides finely rugose with at most a few obscure granules; transverse striae as in *C. rugulosus*, sometimes strongly impressed, producing between them a well marked transverse fold; scales very dense or imbricate below and at sides, less dense above and there concentrated in two very ill-defined longitudinal tracts with, in addition, a small dense spot on posterior margin very near sides (best seen without magnification). *Scutellum* punctate, microrugose, sometimes strongly raised, bare or squamose. *Mesosternal process* broad, apex truncate. *Elytra* globose (10 : 7·5–8·5), apex acuminate, shape similar in both sexes; humeral tubercle usually obsolete; post-humeral tubercle very large and broad-based as in *C. rugulosus* but with apex drawn out into an acute but blunt cone with axis deflexed ventrad; striae distinctly impressed on declivity only, strial punctures very small, sometimes obscured by scales; interstriae broad, flat, sometimes almost smooth but usually forming a series of low irregular transverse folds as in *C. rugulosus*; scales uniformly very dense throughout, whitish but brown scales predominate on declivity and form irregular patches on disc or are concentrated on interstriae 2, 4 and 6, forming dark stripes (rarely elytra brown throughout, except at sides). *Legs* as in *C. rugulosus* but hind femora less strongly tapering towards base (viewed from above) and outer surface near base with large, sometimes confluent, punctures; corbels always with many adventitious setae; scales large, round and very dense throughout. *Underside* as in *C. rugulosus* but granules on ventrite 1 of male less well developed. *Aedeagus* (Text-fig. 25) very short, very strongly curved, depressed, terete, smooth; apex narrow, tip not deflexed. *Ovipositor* with valves strongly and closely compressed.

Holotype ♀. WESTERN AUSTRALIA: Esperance, 23.iv.1955 (*F. H. Uther Baker*), in the Western Australian Museum, Perth.

Paratypes. 8 ♂, 5 ♀, same data as holotype (10 FHUB, 2 BM(NH), 1 W); 3 ♂, 5 ♀, ditto but 22.iv.1955 (5 FHUB, 2 A, 1 BM(NH)); 2 ♂, 3 ♀, ditto but 25.iv.1955 (3 FHUB, 2 BM(NH)); 1 ♂, 1 ♀, Myrup, 26.iv.1955 (*F. H. Uther Baker*) (FHUB); 2 ♂, 1 ♀, Dalyup, 6.v.1960 (*F. H. Uther Baker*) (2 FHUB, 1 BM(NH)); 1 ♂, 1 ♀, Eradu, 21.x.1914 (*J. Clark*) (S). Total: 34 specimens.

Localities: Esperance; Myrup; Dalyup. The record for Eradu must be a mistake.

The name of this species was proposed by Marshall (i. litt.) as a well deserved tribute to Dr. Uther Baker. The general shape and especially that of the prothorax will distinguish this species from any other.

### *Catasarcus obesus* sp. n.

(Text-figs. 2, 11, 26, Map 4)

Length 7·8–12·6 mm. Body black, legs and antennae very dark red. Scales white (with pink and green reflections) and olive-brown, dense throughout body and on legs. *Head* with frons flat or weakly convex; lateral frontal carinae straight (rarely weakly curved), usually sharp but not, or weakly, raised, weakly converging anteriorly; admedian carinae as long as laterals or nearly so (rarely only half as long), straight or weakly curved, parallel with adjacent lateral carinae or with each other and all four carinae usually equidistant from each other (Text-fig. 2); median frontal sulcus broad, deep and rather short; centre of frons without any median elevation, sides, including admedian carinae and lateral sulci, covered with dense round white scales which are continuous with imbricate ovate scales on vertex; latter usually olive-brown but often white in continuation of the frontal tracts; centre of frons with scattered or dense, mainly olive-brown scales; underside of head throughout with dense ovate scales, often becoming imbricate below (and behind) eyes. *Rostrum* × 1·2–1·4 (♂), × 1·1–1·2 (♀) as long as broad, distinctly widening apically; epistome well defined, disc flat or weakly concave, pitted, with two (apparently one) small flanking setae on each gena; median carina narrow, usually moderately and evenly raised but sometimes strongly raised and arched; dorsal surface densely squamose throughout, sides rounded basally, weakly converging apically; chin variable. *Antennae* with lengths of funicle segments 1–3 in ratio 1·9 : 1·5 : 1 (mean of nine), 4–6 slightly shorter than 3, subequal, 7 = 3 and *c.* × 1·7 as long as broad. *Prothorax* very strongly transverse (10 : 18·7–23·8), broadest near base, sides rounded, converging anteriorly; post-ocular lobes poorly to fairly well developed; upper surface smooth, very finely punctured (rarely with ill-defined granules at sides); transverse striae variable, posterior straight, often extending across full width (ill-defined in mid-line), anterior shorter, usually recurved posteriad towards sides; scales imbricate above coxae and along sides, often forming a stripe; elsewhere less dense or mainly olive-brown, sometimes forming two broad white longitudinal tracts on pronotum. *Scutellum* smooth, finely punctured, squamose. *Mesosternal process* very broad (as broad as base of middle femur) and usually abruptly truncate at apex. *Elytra* globose-acuminate (10 : 7–7·7), differing little between the sexes but inflated at base in some females; humeral tubercle small (rarely obsolete), usually cariniform with obtuse apex displaced posteriad; post-humeral area with a broad bulge, sometimes surmounted by a sharp tubercle; striae distinctly impressed on declivity only, elsewhere surface thrown into a series of more or less continuous transverse folds; scales dense throughout, imbricate and exclusively white on sides around post-humeral tubercle, folds and interstriae bare (? abraded) or with olive-brown scales which form an irregular variegated pattern. *Legs* stout but femora scarcely swollen (Text-fig. 11); fore tibiae incurved towards apex and with rather large teeth; corbels narrow and usually with several adventitious setae; scales very dense throughout, round, white (often with greenish reflection) and olive-brown, uniformly mixed; setae slender, brown, inconspicuous. *Underside* very finely rugose; ventrites 1 and 2 with very small discrete granules; post-coxal cavities shallow or absent; densely and evenly squamose throughout, scales white but sometimes each ventrite with two olive-brown patches, near sides. *Aedeagus* (Text-fig. 26) strongly curved, smooth; apical half slender, depressed, weakly sulcate dorsally; apex narrow, tip somewhat swollen and not, or very weakly, deflexed. *Ovipositor* with valves strongly compressed.

Holotype ♂. WESTERN AUSTRALIA: Lake Varley, 20.ix.1954 (*F. H. Uther Baker*), in the Western Australian Museum, Perth.

Paratypes. 7 ♂, 2 ♀, same data as holotype (7 FHUB, 2 BM(NH)); 1 ♀, Ravensthorpe, 2.ix.1952; 1 ♀, Lake Carmody, 20.ix.1954; 1 ♂, same locality, 23.ix.1954 (all *F. H. Uther Baker*) (2 FHUB, 1 BM(NH)); 1 ♀, Dedari, i.1939 (*F. E. Wilson*) (FEW); 1 ♂, 4 ♀, Southern Cross, viii.1959 (*H. Demarz*) (4 Frey, 1 BM(NH)); 1 ♂, ditto but 5.ix.1962 (Frey); 10 ♂, 6 ♀, Widgiemooltha, 1.x.1962 (*A. M. Douglas* and *W. D. Findlay*) (12 W, 3 BM(NH), 1 V); 1 ♂, Kuminin [? = South Kumminin] (*E. F. du Boulay*) (S). Total: 37 specimens.

Localities: as listed above.

Host-plants: *Jacksonia* sp. (series from Widgiemooltha).

### ***Catasarcus aspergetus* sp. n.**

(Text-fig. 32, Map 4)

♂. Length 12·3–13·7 mm. Body black, legs and antennae dark red. Scaling dense throughout, bluish white with black and golden-yellow patches. *Head* with frons flat or convex; lateral frontal carinae strongly raised, fairly sharp, straight or weakly curved, very weakly converging anteriorly; admedian carinae narrow, straight, parallel, as long as laterals or shorter; lateral sulci deep, filled with dense raised round or ovate yellow scales which extend (less densely) over admedian carinae and posteriorly to level of hind margins of eyes; scales behind eyes black, elsewhere on vertex and underside of head white, ovate and dense becoming imbricate below eyes. *Rostrum* × 1·1–1·2 (♂) as long as broad, widening rather abruptly towards apex; epistome flat, triangular, pitted; median carina broad, smooth, slightly or distinctly raised near base and projecting over transverse furrow; sides of dorsal area parallel, strongly raised, resulting lateral sulci filled with white or yellow scales. *Antennae* with lengths of funicle segments 1–3 in ratio 2 : 1·56 : 1 (mean of two), 4–6 subequal, 7 = 3 and × 1·4–1·6 as long as broad; club black, in strong contrast with whitish funicle. *Prothorax* transverse (10 : 17·7) broadest about middle and there angulate, sides posteriorly straight, subparallel or weakly converging, anteriorly weakly curved and distinctly converging; post-ocular lobes well developed and with (relatively) long vibrissae; pronotum uneven, finely punctured, obscurely granulate at sides; anterior transverse stria shallow or obsolete, posterior almost complete but ill-defined in mid-line; scales mainly white, very dense and imbricate at sides and above coxae; dorsal surface in anterior half with two admedian patches of dense yellow scales which also cover post-ocular lobes and surrounding area. *Scutellum* smooth, with fine punctures and scales. *Elytra* ovate-acuminate (10 : 7·2), strongly and evenly convex; humeral and post-humeral tubercles blunt or obsolete; striae impressed only on declivity where punctures are very small; strial punctures elsewhere large; interstriae consequently narrow but not deformed; scales dense, whitish, yellow and black in patches, forming a complex pattern. *Legs* with femora squamose throughout, scales whitish, round, appressed, mostly contiguous on shaft, tessellate on knee, as also on tibia; tibial teeth small, sharp; corbels with several adventitious setae; setae on femora dark brown and conspicuous. *Underside* with dense round mostly imbricate whitish scales and long semi-recumbent pale setae which are rather conspicuous, especially on ventrite 5; post-coxal cavities small or obsolete, cluster of strongly raised granules behind them in paratype; holotype with anterior half of ventrites 1 and 2 and sides of 3–5 yellow and with some black scales among the white elsewhere. *Aedeagus* as in *C. obesus* but distinctly tectiform basally, not sulcate above and more strongly widening around phallotreme.

Holotype ♂. WESTERN AUSTRALIA: Wialki, ix.1959 (*F. H. Uther Baker*), in the Western Australian Museum, Perth.

Paratype ♂. Nulla Nulla, [19]33–352 (W).

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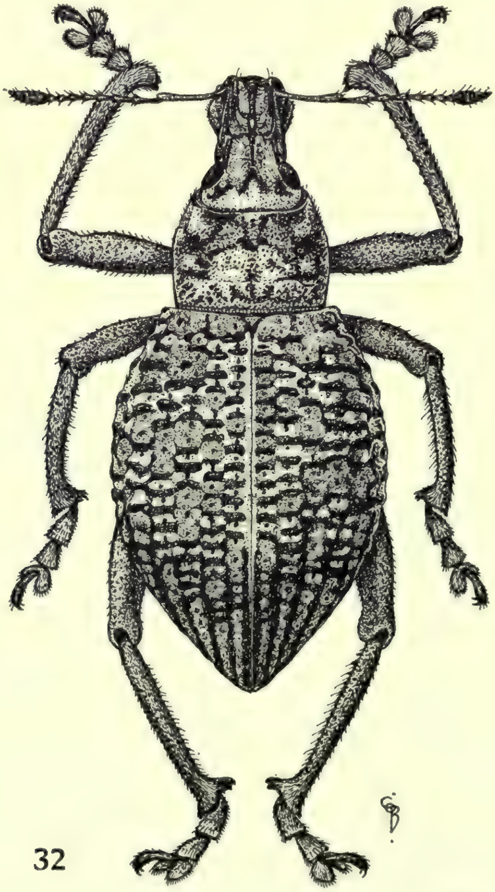


FIG. 32. *Catasarcus aspergetus* sp. n. ♂ (holotype).

Localities: as listed above. Of the several localities bearing the name Nulla Nulla, that nearest to the type-locality is assumed to be the one at which the paratype was taken.

It will be interesting to see, when further material is available, how the colour-pattern in this species varies. Even the present specimens differ; in the paratype, the interstriae and gaps between successive punctures are on the same level and both covered with black scales, producing a strongly marked reticulate pattern, while the punctures are filled with either white or yellow scales. The latter are in a minority and apart from a few on the disc, occur only at the base and in parts of striae 7 and 8. Where yellow punctures are adjacent, the intervening scales are also yellow (not black) so that continuous yellow areas are formed. This does not, however, disrupt the reticulate pattern very much. In the holotype, on the other hand, raised transverse folds are present on the disc and black scales occur only on them, so that the interstriae are obscured and the scales of both white and yellow punctures are contiguous laterally. The yellow punctures are also contiguous longitudinally, as in the paratype, but are here more numerous. The general appearance, on the disc, is that of a bluish white background with somewhat irregular black transverse lines, upon which has been superimposed a number of irregular deep yellow blotches. On the declivity, where the trans-strial folds are absent, the interstriae are raised and black while the striae are uniformly coloured, yellow dorsally and white at the sides. In this species, as in *C. azureipes*, the centres of the larger strial punctures are bare and pupil-like.

## ***Catasarcus azureipes* sp. n.**

(Map 4)

Length 12·6–17·8 mm. Body black with white and blackish scales; femora red or dark red (knees black) with metallic blue or green scales; tibiae dark red, tarsi black; antennae dark red; setae brown throughout; red-brown powdery exudate often present. *Head* with frons flat or weakly convex, lateral frontal carinae raised, sharp, weakly curved, subparallel; admedian carinae usually as long as laterals (sometimes much shorter), straight, parallel or converging anteriorly, separated by a deep, sometimes wide, median furrow; centre of frons posteriorly usually with fine longitudinal striations, or rarely with a smooth median elevation; lateral sulci densely or sparsely filled with round or ovate white scales which sometimes extend sparsely over admedian carinae; vertex with dense ovate olive-brown and metallic blue-green scales; underside with a narrow tract of pure white scales below eye. *Rostrum* × 1·2 (♂), × 1·1 (♀) as long as broad, weakly widening apically; epistome large, triangular, weakly convex, finely pitted, clearly defined from median carina which is weakly raised, level, sometimes strongly depressed near junction with epistome; sides of dorsal area parallel, strongly raised, the resulting sulci filled with sparse or fairly dense ovate-elongate semi-erect white scales; oblique basal sulci usually well developed; apex in profile view rounded ventrally. *Antennae* with lengths of funicle segments 1–3 in ratio 2·2 : 1·42 : 1 (mean of four), 4–7 subequal, slightly shorter than 3, 7 broader than 6 and × 1·6 as long as broad. *Prothorax* transverse (10 : 16·7–18·6), broadest about middle, sides rather strongly rounded, distinctly constricted behind post-ocular lobes which are less well developed than in *C. obesus* but have longer vibrissae; dorsal surface evenly and finely rugose or obscurely granulate, more distinctly granulate at sides; anterior transverse stria obsolete, posterior stria represented by a deeply impressed line on either side; scales sparse, white and olive-brown (latter inconspicuous), white scales somewhat denser at sides and in anterior constriction; underside with irregular patch of very large round imbricate white scales above coxa. *Scutellum* microrugose or smooth, punctate, usually with several elongate or filiform metallic blue or whitish scales. *Elytra* ovate-elongate (10 : 6·3–6·8), broadest about middle, somewhat flattened above, more steeply declivous posteriorly in female, apex more broadly rounded (in dorsal view) in male than in female; surface smooth and even throughout, devoid of granules and with only the finest puncturation and microsculpture; humeral tubercle obsolete in male, cariniform in female; post-humeral tubercle absent (sometimes represented by a low bulge); striae strongly impressed on declivity but very weakly on disc, especially in male; strial punctures small near suture, becoming larger towards sides, mostly isodiametric in male, strongly transverse in female; interstriae narrow, straight, sometimes partly sinuous; gaps between punctures convex, forming a reticulate pattern with interstriae in male, more strongly raised and linking together in female, producing a rectangular mesh pattern; all raised surfaces with very small olive-brown scales which are very dense on declivity and along suture; punctures filled with larger round white scales which form continuous tracts towards apex (at least at sides); centres of punctures bare, hence pupillate. *Mesepisternum*, mesepimeron and metepisternum with dense round white scales; mesosternum microreticulate and with feather-scales in punctures anteriorly; metasternum and rest of mesosternum, including inter-coxal process, with dense narrow whitish or somewhat hyaline scales. *Venter* with dense semi-erect elongate hyaline scales throughout; setae distinguished from these only by their greater length; ventrites 1 and 2 with large low granules, more evident at sides; post-coxal cavities large in male, small in female. *Legs* rather densely squamose; fore femora usually strongly swollen, as in *C. opimus*, with small round appressed vivid metallic blue or green scales; those on coxae and bases of femora larger, denser, ovate, whitish with strong green reflection (sometimes thus throughout); knees black with very dense, mostly blackish scales; tibiae with mixed blackish and green scales; tarsi with scales mostly or entirely blackish; setae on femora blackish, rather conspicuous; tibial teeth very small but hind tibia in male often with two to four larger teeth; corbels with one to several adventitious setae. *Aedeagus* similar to that of *C. obesus*; compressed in middle, and gradually widening around phallotreme; apex short, tip broadly rounded, swollen, not deflexed.

Holotype ♂. Western Australia: Lake Grace, [19]51–2105, in the Western Australian Museum, Perth.

Paratypes. 1 ♂, 2 ♀, same locality as holotype, 51–2103, 51–2104, 51–2224 (all W); 1 ♂, same locality, 51–2102 (BM(NH)); 1 ♀, Lake King, 31–843 (W); 1 ♂, ' W. Aust., L. E., 8.10 ' (V); 1 ♂, 2 ♀, Ongerup, 30.i.1961 (*F. H. Uther Baker*) (2 FHUB, 1 BM (NH)); 1 ♂, 1 ♀, Jarramongup [Jeramungup], 19.iv.1958 (*F. H. Uther Baker*) (FHUB). Total: 12 specimens.

Localities: as listed above.

In the specimens from Ongerup the scales on the venter are ovate-acuminate, whitish (tinted with brown exudate) and are thus quite distinct from the clothing setae. In one of the females from this locality most of the scales on the head and pronotum are of a strong metallic blue-green colour instead of white or bluish white.

An attractive and distinctive species. When totally abraded, however, it may be confused with *C. asphaltinus*.

## *Catasarcus varus* sp. n.

(Text-figs. 10, 29, Map 4)

Length 8·8–12 mm. Body black with fairly dense golden or greenish white scales; legs red with pearly or whitish scales; setae brown throughout. *Head* with frons flat or weakly convex;

both pairs of frontal carinae rounded, weakly curved, weakly converging anteriorly and all equidistant from one another, admedian carinae as long as laterals or shorter (sometimes only half as long); shallow lateral sulci and admedian carinae covered with ovate golden scales; median frontal sulcus very wide and short; centre of frons smooth or with very feeble median elevation; underside throughout with fairly dense ovate or elongate pearly scales. *Rostrum* as long as broad in female, < × 1·1 as long in male, scarcely widening apically; epistome very large, well defined, flat or weakly convex, pitted and finely microreticulate with two (apparently one) flanking setae on each gena; median carina broad, smooth, level or weakly arched; dorsal area parallel-sided, lateral sulci rather deep, with ovate scales, typically golden basally, pearly apically; apex not at all expanded ventrally, mentum thus making an acute angle with epistome. *Antennae* with lengths of funicle segments 1–3 in ratio 2·35 : 1·5 : 1 (mean of three), 3–6 subequal, 7 × 1·7 as long as broad. *Prothorax* strongly transverse (10 : 19–20·7), broadest near base, sides weakly rounded, often parallel in basal half; post-ocular lobes fairly well developed; dorsal surface before anterior transverse stria smooth, shiny, with fine diffuse punctures, elsewhere obscurely rugose with some very ill-defined granules at sides; transverse striae well marked but irregular on disc; most of sides and underside with dense large ovate golden scales, upper side with sparse smaller ovate pearly scales throughout with, in addition, a small and fairly discrete pair of admedian patches of golden scales on anterior transverse stria and further golden scales along hind margin, usually forming a pair of very ill-defined patches directly in line with anterior ones. *Scutellum* smooth, finely punctured, with numerous elongate and filiform metallic scales. *Elytra* ovate (10 : 6·6–7·3), declivity almost vertical in female, evenly rounded in profile view in male; humeral tubercle of small or moderate size; post-humeral tubercle small or obsolete; striae impressed strongly on declivity, weakly elsewhere; interstriae convex, uniting across striae to form a regular hexagonal reticulum in male and a series of narrow transverse folds in female; scaling fairly dense, scales round, golden or greenish white, denser at base and in punctures; interstriae at sides with pearly or coppery scales, interspersed with smaller olive-brown scales especially on disc and declivity where latter may predominate. *Legs* red, unicolorous, or dark red with knees and tarsi almost black; hind femora distinctly curved in lateral as well as dorsal view (Text-fig. 10); tibial teeth very small in both sexes; corbels with few to many adventitious setae; femora with dense round pearly or whitish scales throughout; tibiae with very dense olive-brown scales dorsally, less dense and pearly ventrally; tarsi with dark scales; setae very dark throughout. *Venter* with post-coxal cavities linear in male, obsolete in female; ventrites 1 and 2 with scattered raised granules, strongly raised at sides in male; ventrites 3–5 with dense round golden scales at sides and elongate pearly scales elsewhere; ventrite 5 convex in both sexes. *Aedeagus* (Text-fig. 29) strongly tapering, tectiform and rugose dorsally in basal half; apical region slender, smooth, scarcely widening around phallotreme; tip elongate, not deflexed.

Holotype ♂. WESTERN AUSTRALIA: Esperance, 5.v.1960 (*F. H. Uther Baker*), in the Western Australian Museum, Perth.

Paratypes. 1 ♂, 1 ♀, same data as holotype but 23.iv.1955 (FHUB); 1 ♂, ditto but 22.iv.1955 (BM(NH)); 2 ♂, Esperance, Duke of Orleans Bay, 4.v.1960 (*F. H. Uther Baker*) (FHUB, BM(NH)); 2 ♂, Myrup, 26.iv.1955 (*F. H. Uther Baker*) (FHUB, BM(NH)); 1 ♀, ' W. Australia ' (V). Total: 9 specimens.

Localities: Esperance; Myrup.

In one of the specimens from Myrup all the scales are smaller and fewer in number than in the holotype, while in the other specimen from this locality most of the scales, especially on the elytra, are ovate instead of round.

## ***Catasarcus ustulatus*** **sp. n.**

(Plate 1, Figs. 1, 2)

Length 10·5–11·2 mm. Entirely black. Scales dense, mainly golden brown; elytra with nine pale grey stripes, declivity unicolorous blackish brown. *Head* with frons distinctly convex; lateral frontal carinae fused indistinguishably with admedian carinae to form a pair of broad smoothly rounded prominences, separated by a short deep narrow cleft; eyes weakly convex. *Rostrum* × 1·2 as long as broad; posterior angles of dorsal area reduced to tubercles flanking the very broad strongly raised (and arched) median carina which projects posteriorly over the short transverse furrow; epistome small, strongly pitted, with greater part of disc sharply depressed, leaving broad carinae posteriorly; moderate chin present. *Antennae* with lengths of funicle segments 1–3 in ratio 2·4 : 1·96 : 1 (mean of two), all stout: 1 × 2·8, 2 × 2·5, 3 × 1·4 as long as broad and 7 as broad as long; club fusiform. *Prothorax* transverse (10 : 17·4–18·1), broadest about middle, sides subparallel in basal half, strongly rounded anteriorly; anterior constriction well marked, post-ocular lobes very large, rounded, vibrissae short, brownish, directed strongly dorso-mesad; transverse striae traceable but irregular; disc fairly even, with low rugae laterally and some granules at extreme sides; post-coxal callus with elliptical inter-coxal process. *Scutellum* relatively large, with dense or imbricate pale metallic scales. *Mesosternal process* strongly constricted in middle, hence spatulate. *Elytra* ovate-acuminate (10 : 6·8–7·4), declivity slightly steeper in female than male; humerus with low bulge in male, large rounded tubercle in female; post-humeral tubercle in both sexes large, strongly projecting, blunt and somewhat reflexed postero-ventrad; striae weakly impressed on disc and declivity (as in *C. hopei*); strial punctures small; interstriae 3, 5, 7 and middle part of 8 more strongly convex than others, especially in female; all interstriae on disc with a few irregularly disposed granuliform segments which occasionally unite to form a few short, very irregular transverse folds. *Legs* stout; fore femora scarcely swollen, weakly curved in vertical plane; middle and hind femora not swollen, broadest near apex; inner edge of all tibiae weakly bisinuate; teeth on fore and middle tibiae large, straight and narrow, largest just proximal of middle; teeth on hind tibiae much smaller and fairly uniform; corbels with few, if any, adventitious setae; scales very dense throughout, mainly pearly or golden on femora, mainly blackish brown on tibiae and tarsi; ventral extremity of each trochanter with a cone of imbricate brilliant whitish scales; setae very dark brown throughout, small but conspicuous on femora. *Venter* without any post-coxal depression in either sex; ventrites 1 and 2 with numerous small granules in male.

*Vestiture* of the three available specimens closely similar; scales of three main types: *golden* (mostly shortly ovate or round, sharpely acuminate, mainly semi-erect), *grey* (larger, quadrate, strongly ribbed, longitudinally convex, recumbent) and *dark brown* (as grey but smaller and usually more elongate). Head and rostrum with mainly golden scales but variable tract of dark brown scales along middle of head from transverse furrow to vertex; similar scales behind eyes and on part of median rostral carina; eyes narrowly encircled by brilliant pearly scales; underside of head with large pearly scales thinly sprinkled with brown; scales on genae and beside epistome pale grey; setae large, whitish. Antennae with scales uniform blackish brown but some grey on head of scape. Prothorax with mainly golden scales (paler and more brilliant at sides) but with median and adlateral dark brown stripes, former stopping short posteriorly before hind margin, latter anteriorly at anterior constriction; some pearly or grey scales intermixed with brown; further brown areas below sides and above coxae; setae brown throughout. Elytra with large pale blue-grey scales on the following interstriae: 1 and 3 over greater part of width in basal third to half; 5 similarly, from base to declivity; 7 at base (including entire humeral tubercle) and on most strongly convex part, just before declivity; this last, together with patches on 8 and 9, forms a prominent lateral flash which also covers greater part of post-humeral tubercle (in 10) and is usually narrowly connected to the humeral tract; irregular areas of blackish brown scales occur on more strongly convex interstriae and on declivity; remaining areas golden brown, scales becoming smaller and more erect towards apex, setae blackish brown throughout, very numerous on declivity.

*Aedeagus* terete but tectiform, smooth, tapering from base to apex without any expansion around phallotreme; apical region narrow, tip not deflexed.

Holotype ♀. Western Australia; '161 mile peg, Augusta Rd.', 19.iv.1957 (*J. A. L. W[atson]*) *via* L. M. Saunders, in the Western Australian Museum, Perth. (The collector's initials are inscribed beneath the data label.)

Paratypes. 1 ♂, 1 ♀, same data as holotype (W, BM(NH)).

The very precise type-locality is in the Yelverton area not far from Cape Naturaliste. Host-plants: *Leptospermum* sp. (type series).

## ***Catasarcus rugulosus*** Boheman

(Text-fig. 27, Map 4)

*Catasarcus rugulosus* Boheman in Schönherr, 1845 : 380.
*Catasarcus rugulosus* Boheman; Pascoe, 1870 : 18.

Length 6·5–10·4 mm. Body black, legs and antennae dark red. Scales dense, mostly pearly or coppery, usually largely obscured or discoloured by golden brown powdery exudate. *Head* with frons weakly convex; lateral frontal carinae short, rounded and not, or very weakly, raised (rather strongly raised and sharp in some large females), straight or weakly curved, rather strongly converging anteriorly; admedian carinae variable, usually about as long as laterals, straight, parallel or weakly converging anteriorly; centre of frons even, or with a smooth elliptical or cariniform elevation; densely squamose throughout, including frontal carinae; lateral carinae with smaller scales; centre of frons with small appressed grey-brown scales; underside of head with dense oblong brilliant pearly scales, imbricate below eye (some also in front of eye); similar scales on vertex, but there often mixed with grey-brown scales especially in mid-line and behind eyes; eyes very weakly convex and × 1·7 as long as broad. *Rostrum* × 1·1–1·2 as long as broad, distinctly widening apically; epistome large, triangular, disc flat or depressed, finely pitted and microreticulate, with two (apparently one) flanking setae; median carina narrow, level, usually very weakly raised; dorsal area rectangular or with sides weakly converging basally, scales dense throughout but especially so at base; chin small and ill-defined. *Antennae* with lengths of funicle segments 1–3 in ratio 2·4 : 1·7 : 1 (mean of five), 3–7 subequal, 7 about × 1·3 as long as broad. *Prothorax* transverse (10 : 17·3–20), broadest between middle and base, sides more or less rounded and converging anteriorly; post-ocular lobes well developed; upper surface smooth or obscurely granulate with large and small punctures, usually with more distinct granules at sides; transverse striae variable, anterior strongly recurved posteriad, often obsolete or concealed by scales, posterior straight, incomplete in mid-line; scales dense below and at sides; upper surface with two broad pale ill-defined tracts which sometimes unite along hind margin but do not reach anterior margin; between these tracts a pair of round ill-defined pale spots on posterior transverse stria (best seen without magnification); rest of upper surface with much smaller and sparser pearly or grey-brown scales. *Scutellum* smooth, with numerous elongate scales. *Elytra* ovate-acuminate (10 : 7–7·6), narrower in male, inflated posteriorly in female; declivity oblique and apex weakly mucronate in both sexes; humeral tubercle obtuse, cariniform or obsolete; post-humeral tubercle moderate to very large, densely squamose, apex blunt or very blunt, base almost completely undefined, continuing in a straight line to shoulder (seen from above), similarly to costa ventrally and often continuous with convexity of elytra dorsally (seen from behind); striae weakly impressed on declivity, obscure or absent elsewhere; surface of disc thrown into a series of very low undulating transverse folds (sometimes obscured by scales); scales very dense throughout; sides, including post-humeral tubercles, with large round brilliant pearly scales; disc with coppery or deep golden scales which become progressively smaller darker and semi-erect on declivity where there are numerous small grey-brown squamiform setae; sometimes interstriae 3 and 5 with denser scales, forming pale stripes. *Legs* stout, femora weakly swollen with a dark spot at apex on inner and outer faces; fore and middle tibiae distinctly incurved towards apex, teeth large; hind tibiae straight, teeth usually subequal; corbels without, or with few adventitious setae; femora with round or ovate pearly scales on dorsal and ventral surfaces, setae broad and whitish (dark on knees); tibiae with scales round and dense or tessellate dorsally, ovate or elongate and sparse ventrally, setae dark. *Venter* with post-coxal cavities linear or absent; ventrites 1 and 2 with small scattered granules, denser, strongly raised and bead-like at sides of ventrite 1 in male; much less well developed or obsolete in female; scales dense and usually pearly throughout but sometimes golden on much of ventrite 2 and at sides of 3–5. *Aedeagus* (Text-fig. 27) tectiform in basal half, depressed apically; sides evenly tapering throughout; apex elongate, tip bluntly pointed, not deflexed. *Ovipositor* rather slender and about as broad as high; valves closely compressed.

Holotype ♂, with ' N. Holl./Hope ' in Schönherr's hand and ' Typus ' (printed) in Naturhistoriska Riksmuseum, Stockholm. Apparently unique. The Hope collection (Oxford) contains a female with ' rugulosus/Schonherr ' in what appears to be Hope's hand.

Over 60 specimens seen.

Localities: Albany (numerous records); Two People Bay; Waychinicup River; Cheyne Beach; Stirling Range (south); Borden. Apart from several old records for ' Swan River ', there is a false record for Melbourne in the Fry collection (*ex* Stevens) (BM(NH)).

Pascoe was unacquainted with this species when he made his revision but there is a specimen correctly named by him in the Fry collection (BM(NH)). This supports my view (p. 366) that he did not see Fry's material until his paper was in press; the only specimen of this species in his own collection is the paratype of *C. griseus*.

## *Catasarcus aerosus* sp. n.

(Text-fig. 9, Map 4)

Length 8·7–13 mm. Body black, legs and antennae red (tarsi often black). Scales all or mostly coppery to pale pink. *Head* with frons convex; lateral frontal carinae strongly converging anteriorly, strongly curved to almost straight, usually bluntly rounded and not or weakly raised (rarely sharp and strongly raised); admedian carinae narrow, usually parallel or weakly converging; median frontal sulcus usually short; centre of frons smooth or with longitudinal striations or with a small smooth median elevation; lateral sulci and admedian carinae usually covered with large round semi-erect scales but these are sometimes replaced anteriorly by small elongate olive-brown scales which are also numerous in middle of frons and on lateral carinae; vertex and underside of head throughout with dense elongate appressed pearly scales (sometimes mostly olive-brown on vertex). *Rostrum* × 1·1–1·2 as long as broad, strongly widening at genae; epistome with disc flat or strongly depressed, coarsely pitted and microreticulate with a tuft of two to four flanking setae on either side; median carina rather narrow, strongly (rarely weakly) depressed in middle, raised at base (Text-fig. 9); dorsal area usually broader at apex than at base, sides straight or angled at junction with upper margin of scrobe; lateral sulci deep, filled with ovate scales and white setae, the latter predominating apically; chin distinct. *Antennae* with lengths of funicle segments 1–3 in ratio 2·2 : 1·6 : 1 (mean of five), 4–6 slightly shorter, subequal, 7 = 3, conical and × 1·3 as long as broad or less. *Prothorax* transverse (10 : 18·5–19·4), broadest in basal half; sides distinctly and evenly rounded; post-ocular lobes well developed; upper surface smooth or obscurely or irregularly granulate (more distinctly so at sides); both transverse striae usually well marked, except in mid-line; scales large, round and very dense ventrally, especially above coxae and (usually) along sides, forming an ill-defined horizontal stripe; upper surface with smaller, uniformly dense scales of various shapes and sizes (sometimes all elongate olive-brown and inconspicuous) and prominent whitish setae. *Scutellum* microreticulate at base with a number of elongate and filiform scales. *Elytra* broadly ovate-acuminate (10 : 7·1–7·6) with shape as in *C. hopei* but differing less between the sexes; humeral tubercle obsolete or very obtuse, sometimes pre-basal, as in *C. obesus*; post-humeral tubercle small sharp and reflexed posteriad; striae and interstriae as in *C. bilineatus*; scales always very dense at base and on interstriae 9 and 10; elsewhere usually almost as dense and quite uniform but sometimes largely or almost entirely small, olive-brown and inconspicuous. *Legs* in fully mature specimens dark red with coxae, trochanters, knees, apices of tibiae and tarsi black; femora weakly swollen, as in *C. hopei*; teeth on fore tibiae fairly large, those on hind tibiae very unequal, two or three much larger than rest; corbels with few to numerous adventitious setae; tarsi much larger in male than in female; scaling variable, femora usually with fairly dense large round scales ventrally and very small narrow scales dorsally, with large elongate whitish setae throughout; tibiae very densely squamose, setae brown, at least apically; tarsi with whitish scales and dark brown setae. *Venter* with post-coxal cavities small or obsolete in male, usually absent in female; ventrites 1 and 2 with small raised granules (larger and denser at sides of ventrite 1) in male, smaller or obscure in female; with dense ovate scales and white setae throughout. *Aedeagus* similar to that of *C. obesus* but more slender; basal third strongly tapering, curved and evenly convex (not tectiform) dorsally; remainder straight, depressed, parallel-sided or weakly widening around phallotreme; apex short, tip rather broadly rounded, swollen, not deflexed. *Ovipositor* with valves strongly compressed, together much higher than broad.

Holotype ♂. WESTERN AUSTRALIA: Bolgart, 14.xii.1961 (*E. B. Britton* and *A. Douglas*), B.M. 1962–153, in the Western Australian Museum, Perth.

Paratypes. 32 ♂, 17 ♀, same data as holotype (40 BM(NH)), 3 W, 2 V, 2 Frey, 1 S, 1 A); 5 ♂, 6 ♀, Mogumber, 36–5410, –5411, –5412, –5414 and –5420 to –5426 (8 W, 3 BM(NH)); 1 ♂, Bejoording, i.1952 (*F. H. Uther Baker*); 1 ♀, Lancelin, 7.xii.1962 (*F. H. Uther Baker*) (both FHUB); 1 ♂, ' W. Australia ' (S). Total: 64 specimens.

Localities: as listed above. Lancelin is not the island of that name but a nearby mainland settlement.

In some females, interstriae 3, 5 and 7 are wider and more strongly convex than the others. In such cases partial abrasion produces a striped effect, as in many *C. griseus* but with the tones reversed. In addition to the characters given in the key, these species have utterly different aedeagi.

## ***Catasarcus griseus*** Pascoe

(Text-fig. 28, Map 4)

*Catasarcus griseus* Pascoe, 1870 : 16, 22.
*Catasarcus griseus* Pascoe; Lea, 1918 : 266.

Length 8–11·9 mm. Body black, legs and antennae dark red. Scales dense, coppery to whitish. *Head* with frons weakly convex; lateral frontal carinae always well developed, extending posteriorly around top of eye and more or less sinuous (but not sharp); admedian carinae shorter than laterals (sometimes less than half as long), parallel or weakly converging anteriorly; median sulcus variable; centre of frons often with a smooth elongate elevation; lateral sulci rather deep, filled with dense semi-erect round or ovate scales which cover admedian carinae; head behind eyes encircled by dense ovate-elongate closely appressed scales (sparser behind eyes and in mid-line ventrally). *Rostrum* × 1·1–1·2 as long as broad, strongly widening apically; epistome small, disc flat or depressed, coarsely pitted, microreticulate, with several separate flanking setae; median carina usually sharp near junction with epistome, becoming more rounded towards base, often weakly depressed in middle; dorsal area relatively narrow (exposing more of scrobes from above), somewhat lyre-shaped (as in *C. hopei*) or simply subrectangular; lateral sulci often deep, filled with ovate semi-erect scales which, apart from a few small ones, do not extend anteriorly beyond level of apex of epistome; apex strongly expanded laterally and ventrally, so chin well developed as in *C. bilineatus*. *Antennae* with lengths of funicle segments 1–3 in ratio 2·1 : 1·5 : 1 (mean of ten), 3–7 subequal, 7 about × 1·3 as long as broad. *Prothorax* strongly transverse (10 : 18·6–20·5), broadest at base (sometimes near middle); sides straight or weakly rounded in basal half, usually parallel in male, converging anteriorly in female; post-ocular lobes well developed, with relatively long whitish vibrissae; upper surface finely and diffusely punctured and with scattered larger punctures, obscurely granulate on disc, more distinctly so at sides; transverse striae variable, at least posterior well developed at sides; scales large, round or ovate, very dense below and at sides, dorsally forming two longitudinal tracts, often very ill-defined or reduced to a pair of ill-defined patches near anterior margin; rest of upper surface with smaller elongate olive-brown (or whitish) scales and conspicuous whitish setae. *Scutellum* smooth, punctate, with a number of filiform metallic scales. *Elytra* resembling those of *C. hopei* in shape and proportions (10 : 6·8–7·3); sides between humerus and post-humeral tubercle straight; humeral tubercle absent or obsolete; post-humeral tubercle large, broad-based, apex blunt or sharp, reflexed posteriad; striae impressed strongly on declivity, weakly elsewhere; interstriae broad, rather strongly convex especially on declivity, shiny but finely punctured, partly sinuous, partly uniting across the striae to form an irregular reticulum or short low transverse folds; suture sometimes depressed; scales of various sizes, fairly uniformly distributed when surface is even but confined to depressions when intervals, etc., are strongly raised; scales larger and imbricate on interstriae 9 and 10, sometimes dense along suture and alternate interstriae (especially 5), forming pale stripes; extensive area on declivity with very dense round brown scales on interstriae and small pale scales scattered irregularly along striae: setae brown throughout. *Legs* stout, dark red, often with darker knees; tibial teeth large, those on hind tibia very unequal; corbels broad, with from nought to many adventitious setae; tarsi much larger in male than in female; femora fairly densely squamose, scales smaller dorsally, larger ventrally and at apex; tibiae with very dense scales throughout, round along dorsal edge, ovate ventrally; setae whitish but often darker on knees and tibiae. *Venter* with post-coxal cavities variable; ventrites 1 and 2 finely to strongly granulate; densely and uniformly squamose. *Aedeagus* distinctive (Text-fig. 28), terete, smooth (apart from some obscure sculpture below phallotreme); base straight, apex curved (converse of three preceding species); compressed in middle and there higher than broad, highest near phallotreme; sides strongly widened around phallotreme; apex narrow, tip sharp, somewhat swollen, distinctly deflexed. *Ovipositor* as in *C. aerosus*.

Holotype ♂, with ' West/Australia ' and ' Catasarcus/griseus/*type* Pasc.' in BM (NH).

Paratype ♀, with ' Swan River ' (BM(NH)).

Localities: Forrestdale; Maida Vale; East Midland; Kenwick; Bullsbrook; Chittering; Gingin. A record for Geraldton from the J. Clark collection (BM(NH)) is highly dubious.

Host-plants: *Casuarina* sp. (Perth, Maida Vale, 31.viii.1946 (*R. P. McMillan*) (W)). *Leptospermum* sp. (same data as preceding but x.1939 (W)).

The paratype is a female of *C. rugulosus* but the holotype so closely resembles it that Pascoe may be excused for thinking they were conspecific. Lea compared the paratype (sent to him as *C. griseus*) with a specimen of *C. hopei* and considered that they were probably varieties of one species. He based this conclusion on the similarity in the proportions of the first two funicle segments, failing to appreciate the striking differences in the frontal carinae, epistome, etc.

A variable species, easily confused with several others, especially *C. aerosus*. The form of the aedeagus is, however, unique.

### *Catasarcus latheticus* sp. n.

(Map 3)

Length 9·4–10·3 mm. Body black, legs and antennae dark red. Scales coppery or golden where dense, whitish, bluish green or pearly elsewhere but mainly small and brown on declivity of elytra. *Head* with frons distinctly convex; lateral frontal carinae weakly raised, weakly curved, weakly converging anteriorly; admedian carinae short, close together, subparallel, separated by a very narrow median sulcus; sides of frons with dense loose ovate golden scales and erect white setae which extend well beyond level of hind margins of eyes and cover admedian carinae; middle of frons with rather sparse small dark brown scales and similar setae; scales on vertex dense, olive-brown, on underside of head dense, elongate, whitish and metallic. *Rostrum* as in *C. hopei* but genae wider and chin distinct; dorsal area broader, flatter and with well marked oblique basal sulci; tufts of setae flanking epistome with up to six setae per tuft and several much smaller setae on epistome itself at sides; vestiture of dorsal area as that of frons. *Antennae* with lengths of funicle segments 1–3 in ratio 2·4 : 1·4 : 1 (mean of three). *Prothorax* as in *C. hopei* but more distinctly granulate and admedian scale-patches larger, in one case extending as broad tracts to hind margin. *Scutellum* as in *C. hopei*. *Elytra* in both sexes shaped as in male of *C. hopei*, sculpture as in female of that species; entire upper surface (except declivity) with regular pattern of very low, irregular transverse folds; full width of interstria 1, from base at least to declivity with very dense golden or coppery scales and small white setae; similar, less well defined tracts (best seen without magnification) on posterior part of interstria 5 and middle of 6, also at sides from stria 8 to costal margin; elsewhere scales usually smaller and sparser (except in some larger punctures), with mainly brown setae; scales on declivity all small, mainly brown. *Legs* as in *C. hopei* but tarsi more slender, segment 3 in male scarcely larger than in female of *C. hopei*; corbels with eight to ten adventitious setae in male, three in female; scales bluish or greyish white, setae brown (inconspicuous on femora). *Venter* as in *C. hopei*. *Aedeagus* as in *C. bilineatus* but less elongate.

Holotype ♀. WESTERN AUSTRALIA: Moore River (*H. W. Brown*), in the South Australian Museum, Adelaide.

Paratypes. 1 ♂, 1 ♀, same data as holotype (S, BM(NH)).

### *Catasarcus bilineatus* Fåhraeus

(Text-figs. 8, 33, 36, Map 3)

*Catasarcus bilineatus* Fåhraeus in Schönherr, 1840 : 813.
*Catasarcus bilineatus* Hope; Taschenberg, 1869 : 31.
*Catasarcus suturalis* Pascoe, 1870 : 15, 18, **syn. n.**
*Catasarcus bilineatus* Fåhraeus; Pascoe, 1870 : 15, 18.
*Catasarcus bilineatus* Fåhraeus; Heyne and Taschenberg, 1908 : 226; pl. 30, fig. 12.

Length 9–16 mm. Body black, legs and antennae dark red. Scales dense, metallic pink or coppery (rarely whitish); some yellow-brown powdery exudate often present. *Head* with frons flat or weakly convex; lateral frontal carinae variable, weakly to very strongly raised, straight or weakly curved, parallel or weakly converging anteriorly; admedian carinae greatly reduced (as in *C. frontalis*) and completely covered with loose, dense or imbricate ovate scales which fill the broad shallow lateral sulci and extend posteriorly to level of hind margins of eyes or beyond, sometimes continuous with the dense elongate appressed whitish scales of vertex; median sulcus deep, usually almost as long as lateral carinae; frons between eyes seldom with any median elevation, sometimes with a few longitudinal striations; underside throughout with fairly dense ovate or elongate scales. *Rostrum* × 1·2–1·3 as long as broad, proportions similar in both sexes, gradually widening apically; epistome very ill-defined, strongly microreticulate, strongly punctured, with several small setae on disc; flanking setae large and numerous; median carina broad, smooth, raised and arched, highest at, or a little behind, middle (Text-fig. 8); dorsal area broad, weakly lyre-shaped, sides not, or weakly raised, except above antennal insertions, densely squamose throughout; chin very distinct (Text-fig. 8). *Antennae* with lengths of funicle segments 1–3 in ratio 2·4 : 1·4 : 1 (mean of six), 4–7 subequal, slightly shorter than 3, 7 < × 1·5 as long as broad (quadrate in some small females). *Prothorax* transverse (10 : 16·3–18), broadest about middle; sides usually rather strongly rounded but often subparallel in basal half; post-ocular lobes well developed; upper surface finely punctured, smooth and shiny or finely rugose or obscurely granulate; sides always with well defined granules; anterior transverse stria distinct but ill-defined; traces of posterior stria usually slight; post-coxal callus large; dorsal surface variably squamose, sometimes with dense ovate scales throughout (except on much of anterior border), sometimes such scales confined to sides and a large ill-defined patch on either side of disc, sometimes scales smaller, inconspicuous, mixed with small elongate olive-brown scales which are denser near front margin; scales on underside larger, ovate-truncate or oblong, imbricate throughout and extending over at least lower part of post-ocular lobes. *Scutellum* very small, smooth, finely punctured, with elongate and filiform scales. *Elytra* ovate (10 : 6·4–7·2), narrow in male, inflated and with apex weakly mucronate in female; humeral tubercle small or obsolete; post-humeral tubercle small, sharp and reflexed posteriad; striae distinctly, sometimes strongly, impressed throughout; strial punctures small; interstriae broad and strongly convex but also deeply segmented by transverse impressions opposite each strial puncture. These smooth granuliform segments may be isodiametric, transverse or double; in the last case, the two sub-granules lie obliquely to the long axis of the interstria. Usually the striae are more strongly impressed than the transverse impressions, so that the interstriae retain their integrity; in some females, however, the reverse is the case and the interstrial segments join up to form continuous undulating folds across the elytra. Interstria 1 in female broad, flat, finely rugose, sometimes depressed, with large, very dense or imbricate ovate-truncate scales throughout, forming a well marked stripe; scales of sutural stripe less dense in male, especially on declivity; similar dense scales on interstriae 9 and 10 and in strial punctures (coalescing along striae); elsewhere smaller, less dense, often olive-brown on declivity. *Legs* with fore femora scarcely larger than hind, unicolorous; tibial teeth very small, even in male; corbels with from very few to many adventitious setae; scales large and dense on dorsal and ventral surfaces of femora, very small or absent on sides, smaller and subtessellate on dorsal edge of tibiae towards apex, ventral edge largely bare. *Venter* densely squamose throughout; post-coxal cavities well developed in male, shallow or obsolete in female; ventrite 1 in male with numerous raised granules. *Aedeagus* (Text-fig. 36) gradually tapering from base to phallotreme, evenly curved, smooth, terete (margins of phallotreme sometimes shortly produced along dorsal surface); apex evenly tapering to a sharp point, tip extensively swollen, strongly deflexed. *Ovipositor* slender, about as broad as high towards apex; valves compressed.

Holotype of *bilineatus*, ♀, with '*Polydius? bi/lineatus* Hope/Swan Rivier./N. Holl. Hope' and 'Typus', in Naturhistoriska Riksmuseum, Stockholm. Unique. There is also in the Schönherr collection a very small male, with 'Swan Riv./N. Holland./ Hope.' and 'Paratypus' (the latter now inverted).

Holotype of *suturalis*, ♂, with 'Perth' and 'Catasarcus/suturalis/*type* Pasc.' in BM(NH). Unique.

Over 220 specimens seen.

Localities: Perth and environs (numerous records); Wanneru; Bullsbrook; Hill River; Beverley; Jarrahdale; Pinjarra; Waroona; Yarloop; Bunbury; Busselton. A record for Kukerin (W) requires confirmation. A specimen labelled ' Manyanup ' may be from Mayanup. Three specimens with ' Kalgoorlie/W. A./C. Barrett ' in F. E. Wilson's hand (FEW) must be wrongly labelled. Specimens from the J. Clark collection labelled ' Geraldton ' (FEW, BM(NH)) are probably inaccurate if not actually false, as are old records for Albany (' K. G. S. ') and Adelaide in the Hope collection (Oxford).

Host-plants: *Casuarina* sp. (Perth, Maida Vale, 31.viii.1946 (*R. P. McMillan*) (W). One of these is mounted on a card with a specimen of *C. asphaltinus*; the other was originally mounted with two specimens of *C. griseus*). *Jacksonia* sp. (West Midland, 10.x.1953 (*A. Douglas*) (W)).

Pascoe distinguished *C. bilineatus* from *C. suturalis* mainly by the frons which ' rises towards the central groove on each side ' whereas in *C. suturalis* it is ' perfectly

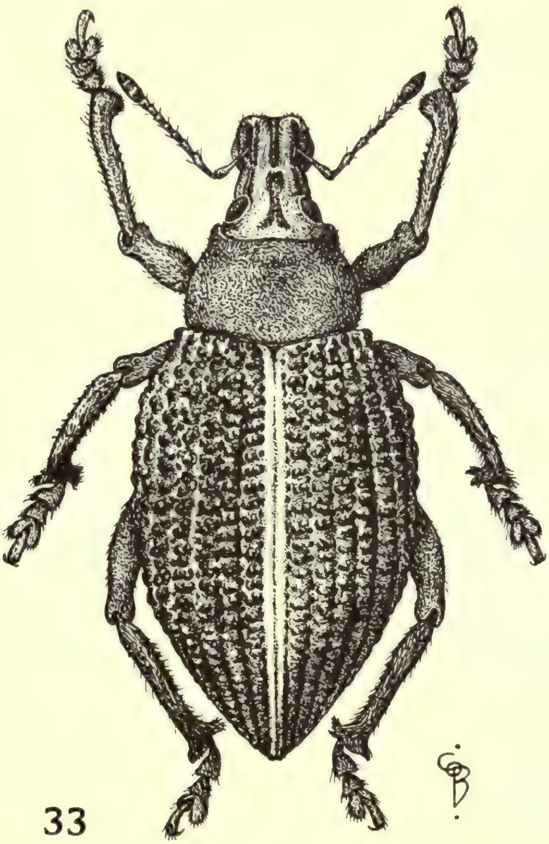


FIG. 33. *Catasarcus bilineatus* Fåhraeus ♀.

flat '. Although there are three typical specimens of *C. bilineatus* in his collection (one so determined by Pascoe himself), it seems that the foregoing distinction was based solely upon a highly aberrant female in which the admedian carinae are about as large as the laterals, giving the frons a distinctly convex appearance. The pronotum of this specimen is also unusual, being strongly and finely granulate throughout. The elytra, however, are normal.

The setose epistome and prominent sutural stripe make this one of the few readily recognizable species. In a very few specimens however, the sutural stripe appears to be totally absent. I have seen only one bleached specimen of this species.

### ***Catasarcus sericeus*** Blackburn

(Text-fig. 34, Map 3)

*Catasarcus sericeus* Blackburn, 1894 : 270.
*Catasarcus sericeus* Blackburn; Lea, 1918 : 267.

♀. Length 10·8–11·8 mm. Body black, legs and antennae dark red. Scales fairly dense, very small, pearly, greenish or coppery. *Head* with frons very weakly convex, with fine diffuse punctures and scattered larger punctures; admedian frontal carinae very broad, very weakly convex, straight, weakly converging anteriorly, defined mesally only by the very narrow median sulcus which varies greatly in length; lateral carinae broadly raised, short, evenly and weakly curved, strongly converging anteriorly; lateral sulci very shallow, narrowly filled with recumbent whitish scales which continue posteriorly, becoming denser behind and below eyes; vertex itself with dense elongate olive-brown scales which also occur sparsely on admedian carinae; eyes small, nearly flat. *Rostrum* × 1·3 as long as broad, distinctly widening towards apex but chin weak; epistome triangular, densely pitted and finely microreticulate, disc usually abruptly depressed and with a few small setae at sides; median rostral carina broad, smooth, evenly raised, not, or very slightly arched; dorsal area weakly lyre-shaped, sides weakly raised, resulting sulci with numerous ovate semi-recumbent scales which may extend along sides of epistome. *Antennae* with lengths of funicle segments 1–3 in ratio 2·3 : 1·65 : 1 (mean of three), 4–7 subequal, scarcely longer than broad. *Prothorax* twice as broad as long, broadest near base; sides fairly strongly rounded, anterior constriction weak, post-ocular lobes fairly well developed; anterior transverse stria usually ill-defined, posterior represented by a short impressed line on either side; upper surface with anterior border smooth, diffusely punctured, remainder obscurely granulate and diffusely punctured with some well defined granules at sides; scales fairly dense but small, elongate, directed antero-mesad, whitish or olive-brown, denser along hind margin and in midline where they form a narrow stripe; underside and post-ocular lobes (in part) with dense larger ovate scales, similar to those around eyes. *Scutellum* with horizontal (apical) portion very small and smooth, remainder microrugose and with a few filiform scales. *Elytra* subglobose (10 : 7·3–7·8), inflated at base, slightly flattened above and at sides and with declivity almost vertical; humeral tubercle pre-basal, very small or obsolete; post-humeral tubercle small, obtuse (sometimes sharp); striae weakly impressed generally, often not at all on disc; strial punctures very small; interstriae broad, flat or weakly convex; narrow trans-strial folds often present on disc, producing a rectangular mesh pattern; scales greenish white or coppery, mostly very small, ovate, appressed, evenly distributed, seldom contiguous and rarely overlapping, except on interstriae 9 and 10 and sometimes in a few strial punctures; centres of punctures bare; interstriae on declivity with olive-brown scales along middle of each. *Legs* fairly densely squamose, femora with some large ovate scales dorsally and ventrally, small elongate ones elsewhere; setae long, pale and recumbent; tibial teeth small; corbels with few adventitious setae. *Venter* with post-coxal cavities shallow or obsolete; ventrites 1 and 2 with very small scattered granules; scales small and sparse apart from small ill-defined patch on either side of ventrites 3–5; setae long, pale and recumbent. *Ovipositor* as in *C. bilineatus*.

Holotype ♀, with '3495/W. A. [red] T. [black]' and 'Catasarcus/sericeus, Blackb.' in BM(NH). Unique.

Five specimens seen, all female (3 S, 1 BM(NH), 1 FEW).

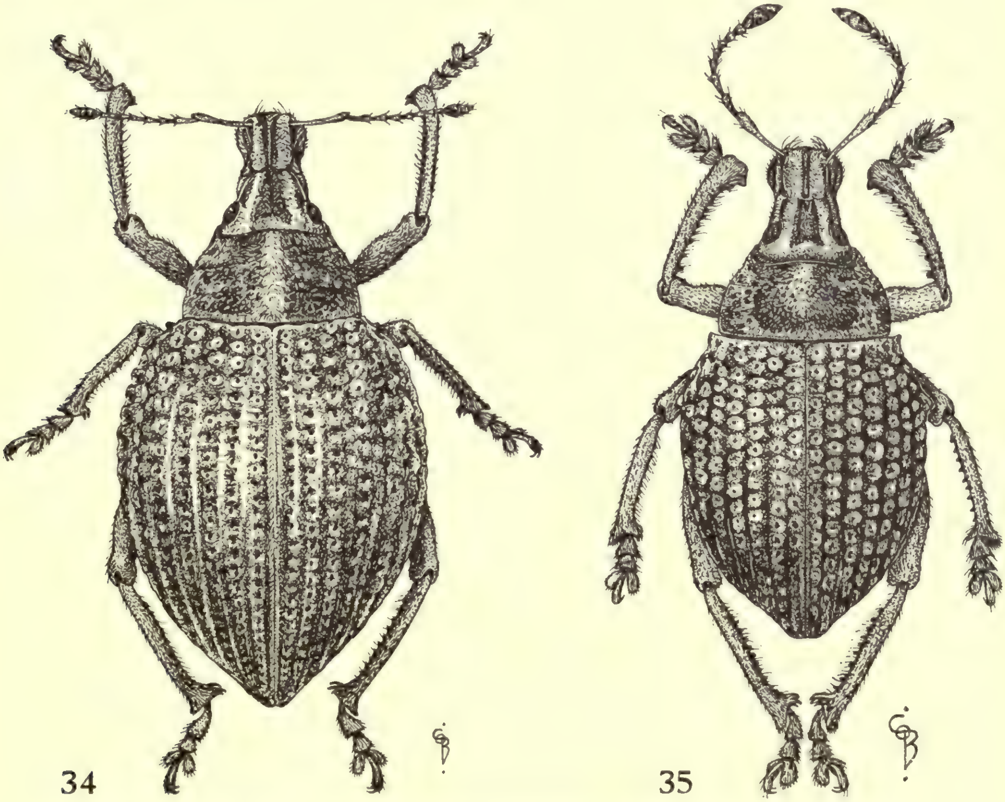
Localities: Tammin. Type-locality unknown.

I have been unable to recognize the specimen from Kuminin [? = South Kumminin] which Lea somewhat doubtfully referred to this species; it may be the specimen from this locality which I have included in the type-series of *C. obesus* but it bears no label by Lea and its colouring does not altogether agree with his description.

## ***Catasarcus hopei*** Fåhraeus

(Text-figs. 3, 6, 35, 37, Map 3)

*Catasarcus hopei* Fåhraeus in Schönherr, 1840 : 815.
*Catasarcus vinosus* Pascoe, 1870 : 16, 21, **syn. n.**
*Catasarcus effloratus* Pascoe, 1870 : 16, 21, **syn. n.**
*Catasarcus Hopii* Fåhraeus; Pascoe, 1870 : 16, 22 [Incorrect subsequent spelling].
*Catasarcus ovinus* Pascoe, 1870 : 16, 26, **syn. n.**



FIGS. 34, 35. 34, *Catasarcus sericeus* Blackburn ♀. 35, *C. hopei* Fåhraeus ♂.

*Catasarcus ovinus* Pascoe; Lea, 1909*a* : 155.
*Catasarcus ovinus* Pascoe; Lea, 1918 : 265.

Length 7·5–14 mm. Body black, legs and antennae dark red. Scales small and dense, whitish, golden yellow, pearly, coppery, green or brown, often all occurring in same specimen with one colour (usually golden yellow or coppery) predominating; yellow-brown powdery exudate sometimes present. *Head* with frons distinctly convex; admedian frontal carinae (Text-fig. 3) very large, straight and parallel or very weakly converging anteriorly, separated by a narrow median sulcus which becomes broader and shallower posteriorly, sometimes with longitudinal striations but with no median elevation; lateral carinae distinct, often sharp, almost straight, parallel or weakly converging anteriorly; lateral sulci narrow, filled with pale scales which do not cover admedian carinae but extend posteriorly to join the dense appressed brown scales encircling back of head; centre of frons and admedian carinae with small brown squamiform setae; underside of head with dense ovate-elongate pale scales throughout, densest below eyes. *Rostrum* × 1·1–1·3 as long as broad, scarcely widening apically; chin weak; epistome elongate, flat or convex, pitted, microreticulate, scarcely defined from median carina which is broad, smooth, usually very strongly raised and arched, highest near base, so that in profile view its curvature is continuous with that of admedian frontal carinae (if these are low, it may exceed them in height) (Text-fig. 6); dorsal area lyre-shaped, sides somewhat raised forming shallow lateral sulci which are filled with scales. *Antennae* with lengths of funicle segments 1–3 in ratio 2·4 : 1·3 : 1 (mean of four), 4–7 subequal, 7 broadest, seldom longer than broad. *Prothorax* strongly transverse (10 : 17·8–20·5), broader in female than in male, usually broadest near base (sometimes near middle); sides rounded, often strongly so; post-ocular lobes fairly well developed, anterior constriction distinct; anterior transverse stria ill-defined, posterior represented by a short impressed line on either side (often obsolete); dorsal surface smooth or weakly granulate, with large and small punctures which vary from diffuse to rather dense; scales also diffuse to rather dense, either uniform or condensed into ill-defined patches, usually one pair above post-ocular constriction and another at base near sides; setae dark brown and inconspicuous. *Scutellum* smooth, usually with a few elongate or filiform metallic scales. *Elytra* with proportions 10 : 6·8–7·6; in male, globose-acuminate, basal two-thirds evenly rounded above and at sides, apical third with sides and declivity almost straight, apex acute; in female, more strongly inflated posteriorly, hence sides and dorsum somewhat flattened, declivity steeper, apex less acute; humeral tubercle small, sharp or blunt, sometimes obsolete; post-humeral tubercle small to moderate, usually sharp and strongly recurved posteriad; striae strongly impressed on declivity and at sides; strial punctures large on disc, diminishing rapidly towards declivity where they are completely obscured by scales. In most males and some females, the strial punctures on the disc are very large and alternate with those of adjacent striae; in these cases, the interstriae are narrow, sinuous and bare and together with the narrow raised gaps between successive punctures, form an hexagonal mesh pattern, exactly as in *C. longicornis*. In some females, however, the punctures are smaller and tend to lie opposite one another; the gaps tend to link up across the broad flat interstriae, forming narrow transverse folds; even where this does not occur, the pattern is that of a rectangular, rather than hexagonal mesh. In some specimens of this latter type, the scaling is denser on alternate interstriae, producing a striped effect; in other cases, the scales along the suture, though no denser than elsewhere, are strikingly lighter in colour. *Legs* densely squamose, scales ovate to elongate, white or greenish white, easily lost; tibiae with small to moderate, sharp, recurved teeth along ventral edges; corbels almost always without any adventitious setae. *Venter* with post-coxal cavities narrow, squamose, deep in male, shallow or obsolete in female; ventrites 1 and 2 with numerous very small granules, often concealed by scales; scales fairly dense, ovate to elongate, pale; setae broad, brown or hyaline. *Aedeagus* highly characteristic (Text-fig. 37), smooth, apical region weakly sulcate below. *Ovipositor* rather slender, valves compressed.

The male specimen described by Fåhraeus is no longer present in the Schönherr collection; this species is there represented by two female specimens. One is that mentioned by Fåhraeus on p. 817 and bears Hope's name (quoted by Fåhraeus) for the female sex (it is virtually the allotype of *C. hopei*); the other is merely labelled ' N. Holl./Hope ' but bears a Stockholm Museum ' Typus ' label (now inverted). By analogy with the other holotypes described by Fåhraeus, the missing specimen would bear the name ' *Polydius? vicinus* Hope '. Among Hope's specimens (Oxford) is a female labelled ' latus/mihi ' in Hope's hand and a male with ' vicinus/Hope ' in a similar hand and on identical paper.

The four specimens mentioned above are certainly conspecific and this leaves little room for doubt as to the identity of the missing holotype Grave doubt does exist, however, regarding the type-locality. As specimens apparently of this species have recently been taken in the Perth area, it is not possible to regard the stated type-locality, Swan River, as necessarily false. On the other hand, the species has always been common at Albany, a fact to which several specimens in Hope's collection labelled ' K. G. S. ' (including the female mentioned above) bear witness. The probability is, then, that all Hope's specimens came from Albany, or nearby and it is at least possible that the two Oxford specimens mentioned above came from the same locality, perhaps even the same series, as the missing holotype. In view of the ease with which flightless Curculionidae subspeciate, I feel that the original concept of this species will best be maintained by designating the Oxford male as neotype, leaving the question of type-locality open, rather than by designating an arbitrarily chosen specimen from an arbitrary locality.

NEOTYPE ♂, with ' Hopei./Schh: Supl/SR. ' and ' vicinus/Hope ' (the latter possibly in Hope's hand) in the Hope Department of Zoology (Entomology), University of Oxford. This specimen is 8·7 mm. long; it is only slightly abraded and fits the description well, although the pronotal maculae are indistinct. It has no unusual features and is complete, except for the left hind tarsal claw-segment.

The following specimens are in BM(NH):

Holotype of *vinosus*, ♂, with ' Champion B. ' and ' Catasarcus vinosus/*type* Pasc.' Probably unique but a very similar specimen has been labelled as a cotype (by G. J. Arrow).

Holotype of *effloratus*, ♀, with ' Champion B.' and ' Catasarcus/effloratus/*type* Pasc.' Unique.

Holotype of *ovinus*, ♀, with ' Queensland ' and ' Catasarcus/ovinus/*type* Pasc.' Unique.

Over 120 specimens seen.

Localities: Albany; Torbay; Tennessee; William Bay; Windy Harbour; Mount Barker; Stirling Range (Bluff Knoll); Cranbrook; Tambellup; Borden; Boscabel; Lime Lake; Nannup; Busselton; Capel River; Bunbury; Buckingham. Also recently taken in the Perth district by Dr. Uther Baker (Mount Pleasant, 8.ix.1958) but must be uncommon there. Apart from this record, there is no reason to think that specimens in the J. Clark collection (and elsewhere) labelled ' Swan River ' actually came from Perth and records from further north—Champion Bay (Pascoe collection), Geraldton, Eradu (J. Clark collection)—are almost certainly false. There remains a very large, strongly inflated female from the J. Clark collection labelled ' Kellerberrin/W. Australia/W. Crawshaw ' but I think this is erroneous also. Patently false records have been seen for all the other states.

Host-plants: *Leptospermum* sp. (Lime Lake, 25.x.1952 (*H. F. Broadbent*) (BM (NH)).

In stating that the description is ' a little ambiguous; the rostrum is said to have three grooves at the base, and two at the apex ', Pascoe shows that he has missed the point. Fåhraeus correctly observed that the true fronto-rostral junction lies posterior to the transverse furrow, so that the latter is to be regarded as situated *on* the rostrum (' ante medium '), not at its base and ' costis sulcisque frontalibus ad incisuram continuatis ', i.e. the four frontal carinae may be regarded as extending on to the base of the rostrum, the remainder of which (beyond the transverse furrow) has three carinae.

In contrasting *C. vinosus* and *C. ovinus*, Pascoe was misled by the sexual dimorphism of this species and by the false locality of the latter specimen. The holotype of *C. effloratus* is a very large but weakly inflated female with very large elytral punctures; I have seen no other specimen like it. Pascoe's specimens determined as *C. hopei* are all much smaller than his three holotypes.

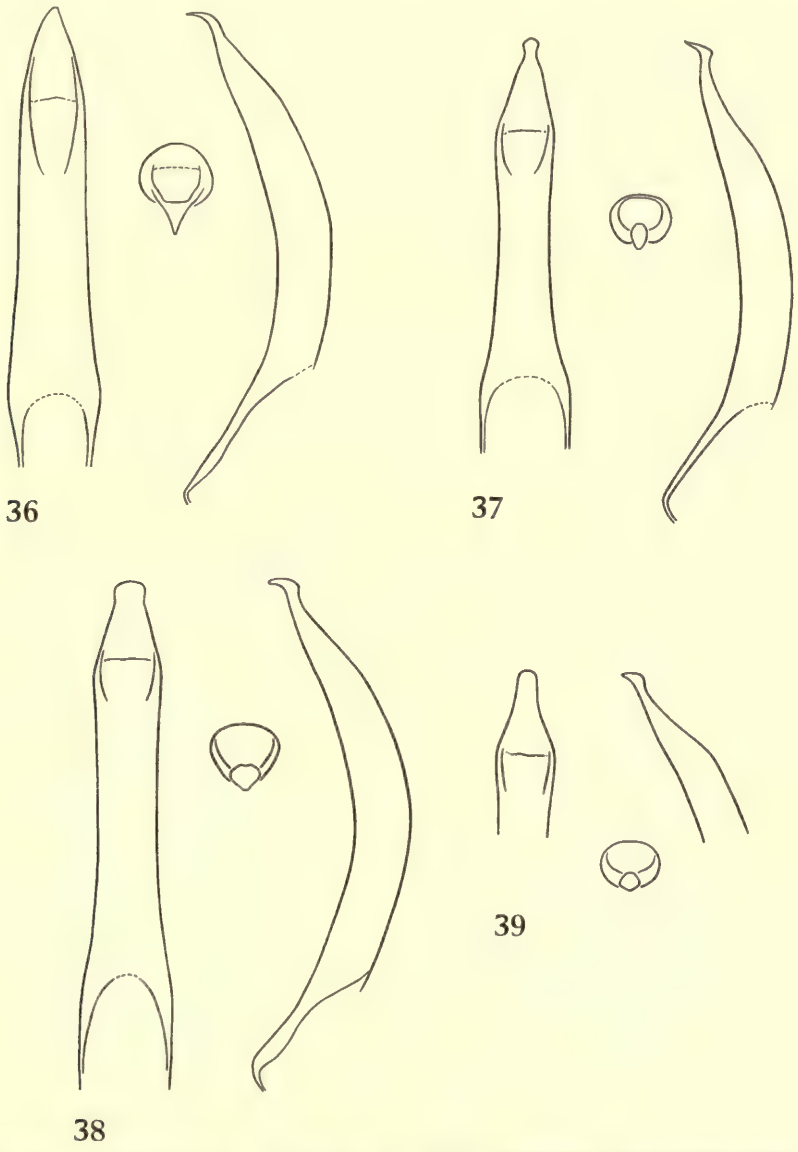
This species is notable for the great variation in its size, shape, vestiture and sculpture on the one hand, and for the very distinctive and constant shape of its aedeagus on the other.

## ***Catasarcus carinaticeps*** Lea

(Text-figs. 38, 39, Map 3)

*Catasarcus carinaticeps* Lea, 1909*a* : 158.

Length 10·9–15·8 mm. Body black, antennae and legs dark red but coxae, trochanters, tarsi and sometimes knees, black. Scales fairly dense, golden and whitish; golden powdery exudate present. *Head* with frons weakly (rarely strongly) convex; lateral frontal carinae sharp, straight or weakly sinuous, parallel or weakly converging anteriorly; admedian carinae straight, narrow, usually parallel, close together, about as long as laterals; median frontal sulcus usually very narrow but if not, then may contain one or two small accessory carinulae posteriorly; lateral sulci wide and usually deep, completely filled with loose imbricate deep orange or golden scales which sometimes cover distal ends of admedian carinae and extend posteriorly to, or just beyond, level of hind margins of eyes; underside of head with dense oblong-elongate pearly scales. *Rostrum* × 1–1·2 as long as broad, gradually widening apically, chin weak; epistome broad, weakly convex, finely pitted, clearly defined or not from median carina which is smooth and shiny, often broad and weakly arched; the broad lateral sulci filled with dense, usually whitish scales which contrast sharply with those on frons; surface of each gena with several large punctures or irregular longitudinal sulci. *Antennae* with lengths of funicle segments 1–3 in ratio 2·1 : 1·4 : 1 (mean of five), 3 and 7 subequal, 4–6 shorter, subequal; shortest segment (usually 6) not more than × 1·5 as long as broad. *Prothorax* strongly transverse (10 : 17·6–20), more strongly so in female than in male, broadest in basal half, distinctly rounded anteriorly; anterior constriction weak, post-ocular lobes well developed; dorsal anterior border smooth or with microsculpture, irregularly and rather coarsely punctured; remainder of dorsal surface with numerous small confluent granules and diffuse punctures, more strongly and regularly granulate at sides; small elongate blue scales occur sparsely throughout (in fresh specimens) and large broad golden scales form irregular but symmetrical patches at sides and (usually) a pair of small admedian patches above anterior constriction; transverse striae weak. *Scutellum* smooth or microrugose, punctured and with elongate blue scales which may cover it completely. *Elytra* ovate (10 : 6·3–7·4), inflated and steeply declivous posteriorly in female, evenly rounded in profile view in male; humeral tubercle distinct and sharp in both sexes, basal, directed obliquely anteriad; smaller tubercles at bases of interstriae 5 and 3, all usually bare and shiny, hence



Figs. 36–39. *Catasarcus* spp. Aedeagus in dorsal, posterior and lateral view. 36, *C. bilineatus* Fåhraeus. 37, *C. hopei* Fåhraeus. 38, *C. carinaticeps* Lea (Esperance). 39, *Idem* (Mount Barren).

conspicuous; post-humeral tubercle very small, sometimes obsolete; raised granules usually present in shoulder region (rarely scattered throughout); striae strongly impressed at base and apex only; strial punctures usually wider than interstriae but not deforming them; base and usually shoulder region with very dense suberect golden scales; similar scales fill strial punctures (sometimes about half the punctures are filled with whitish scales, producing an irregular pattern somewhat as in *C. aspergetus*); interstriae flat and smooth with fairly dense appressed whitish or dark brown scales (which are easily lost). *Legs* fairly densely squamose, femora with dense large ovate-truncate or elongate whitish scales dorsally and in depression below knee ventrally, elsewhere with small elongate blue or green scales; setae short, pale; hind tibia with ventral edge weakly to strongly sinuous in both sexes, male with rather large teeth and stout setae; corbels without, or with only one or two adventitious setae. *Venter* with post-coxal cavities deep in male, shallow or obsolete in female and often filled with scales; ventrites 1 and 2 in male with large raised granules at sides, otherwise smooth or with small scattered transversely elongate granules; ventrite 5 strongly microreticulate (1–4 microrugose); fairly densely squamose except disc of ventrite 1 and exposed hind borders of 2–4. *Aedeagus* characteristic (Text-figs. 38, 39), subcylindrical, terete, evenly curved; tip broad, swollen, strongly and rather abruptly deflexed (larger and less abruptly deflexed than in *C. hopei*). *Ovipositor* as in *C. hopei.*

Holotype ♂, with 'carinaticeps/Lea TYPE/Esperance Bay' [*W. W. Froggatt* and *C. French*], in the South Australian Museum, Adelaide.

Paratypes. 1 ♂, same data as holotype (S); 1 ex., ditto (Macleay). I have either not seen, or failed to recognize, the two specimens from Swan River to which Lea refers; it is possible that they belong to another species.

Some 37 specimens seen.

Localities: Esperance; Gibson; Salmon Gums; Widgiemooltha; Ravensthorpe; Hopetoun; Mount Barren (east). A record for Northam (S) is certainly false.

Variation in this species is to some extent regional. Specimens from Esperance area have longer admedian frontal carinae with deeper lateral sulci and their femora are unicolorous; those from the western part of the range have shorter, broader admedian carinae and black knees. The single specimen from Widgiemooltha combines well developed carinae with black knees.

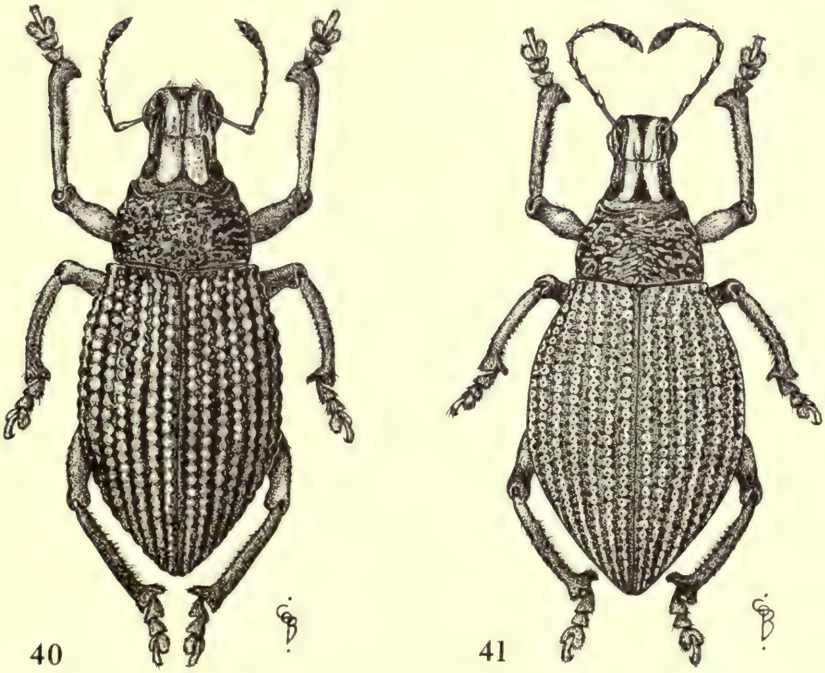
## *Catasarcus frontalis* sp. n.

(Text-fig. 40, Map 3)

Length 10·6–15·3 mm. Body black, antennae and legs dark red (tarsi black). Scales fairly dense, whitish, yellow or (rarely) pink. *Head* with frons flat; lateral frontal carinae distinctly to strongly raised, sharp, varying from almost straight to distinctly sinuous; admedian frontal carinae greatly reduced, as in *C. bilineatus* and completely covered with loose imbricate semi-erect scales which completely fill the very broad flat lateral sulci and extend posteriorly to distinctly beyond level of hind margins of eyes; median sulcus very short; centre of frons, between lateral sulci, raised as a narrow bare flat striate wedge-shaped median carina with its apex projecting into the median sulcus (rarely absent); underside of head with dense elongate pearly scales throughout. *Rostrum* × 1·1–1·2 (♂), × 1–1·1 (♀) as long as broad, gradually widening apically; epistome flat, clearly defined or not from variable median carina; dorsal area densely squamose throughout, as frons. *Antennae* with lengths of funicle segments 1–3 in ratio 2·1 : 1·4 : 1 (mean of five), 7 longer than 6. *Prothorax* somewhat as in *C. asphaltinus* but more strongly transverse (10 : 18–20·4) and usually much more coarsely and irregularly granulate above; scales dense below and between granules dorsally; impressed median line often present, also indicated by scales. *Scutellum* smooth or with punctures and with several oblong-elongate whitish scales. *Elytra* ovate (10 : 6·6–7·3), male evenly rounded dorsally in profile view, female somewhat inflated posteriorly, hence more distinctly declivous in apical third; humeral tubercle usually distinct and sharp (sometimes obsolete); post-humeral tubercle very small, often obsolete; other raised granules often present in shoulder region, sometimes sparsely throughout; a few small smooth shallow sharply defined depressions ('negative granules') often present; striae rather strongly impressed throughout; strial punctures large and filled with scales, which are usually confluent along each stria; interstriae shiny, irregularly and tightly zigzag as in *C. asphaltinus* but with more granules and no wrinkles. *Legs* as in *C. asphaltinus* but femora less swollen and with fairly dense elongate and ovate-truncate whitish scales (easily lost, however); setae small, recumbent, pale or dark; tibiae densely squamose; corbels without, or with very few adventitious setae. *Venter* densely squamose, finely rugose; ventrite 5 strongly microreticulate; ventrites 1 and 2 with discrete bead-like granules, larger and confluent at sides of ventrite 1 in male; post-coxal cavities deep in male, shallow in female. *Aedeagus* stouter and less strongly curved than in *C. carinaticeps*; apex short, evenly tapering, tip less strongly deflexed.

Holotype ♂. WESTERN AUSTRALIA: Toodyay [1952?] (*H. F. Broadbent*), B.M. 1953–106, in the Western Australian Museum, Perth.

Paratypes. 2 ♂, 1 ♀, same data as holotype; 2 ♂, 1 ♀, Kellerberrin (*W. Crawshaw*); 2 ♂, same locality, 3.ii.1907 (*H. M. Giles*); 1 ♀, ditto but 6.ii.1907 (all BM(NH)); 3 ♀ same locality; 1 ♀, ditto (*French*) (all S); 1 ♂, 2 ♀, Tammin, 11.xii.1935 (*R. E.*



FIGS. 40, 41. 40, *Catasarcus frontalis* sp. n. ♂. 41, *C. opimus* Pascoe ♂

*Turner*) (BM(NH)); 1 ♂, 4 ♀, same locality, i.1939 (*F. E. Wilson*) (FEW); 1 ♀, Beverley (*A. M. Lea*) (Macleay); 1 ♂, same locality (*F. H. du Boulay*); 1 ♀, ditto (but *E. F. du Boulay*) (both S); 2 ♀, Spencers Brook, iii.1947 (*R. P. McMillan*); 1 ♂, ditto but 12.iv.1947; 1 ♀, Bejoording, 50–5154 (all W); 1 ♀, same locality, 26.xii.1950 (*R. P. McMillan*) (V); 1 ♂, Cunderdin, 8.i.1955 (*L. Jeanes*) (UW); 1 ♂, same locality, 7843 (BM(NH)); 1 ♀, Merredin (*L. J. Newman*) (BM(NH)); 1 ♂, 'Perth W. A.'; 1 ♂, 'W. A. du B.' and 'K 36538'; 1 ♂, 'W. Austr.' and 'K 36538' (all A); 1 ♂, 'Swan R.' (*L. J. Newman*) (BM(NH)); 2 ♀, 'W. Australia' (Macleay, S.); 1 ♀, 'W. A. 3686' (in red) (S); 1 ♂, without data (V); 1 ♀, Rivertree, N.S.W., ii.1935 (*E. Sutton*) (Gowing-Scopes). Total: 42 specimens.

Localities: Bejoording; Toodyay; Spencers Brook; Beverley; Cunderdin; Tammin; Kellerberrin; Merredin. The record for New South Wales is obviously false and that for Perth is probably inaccurate.

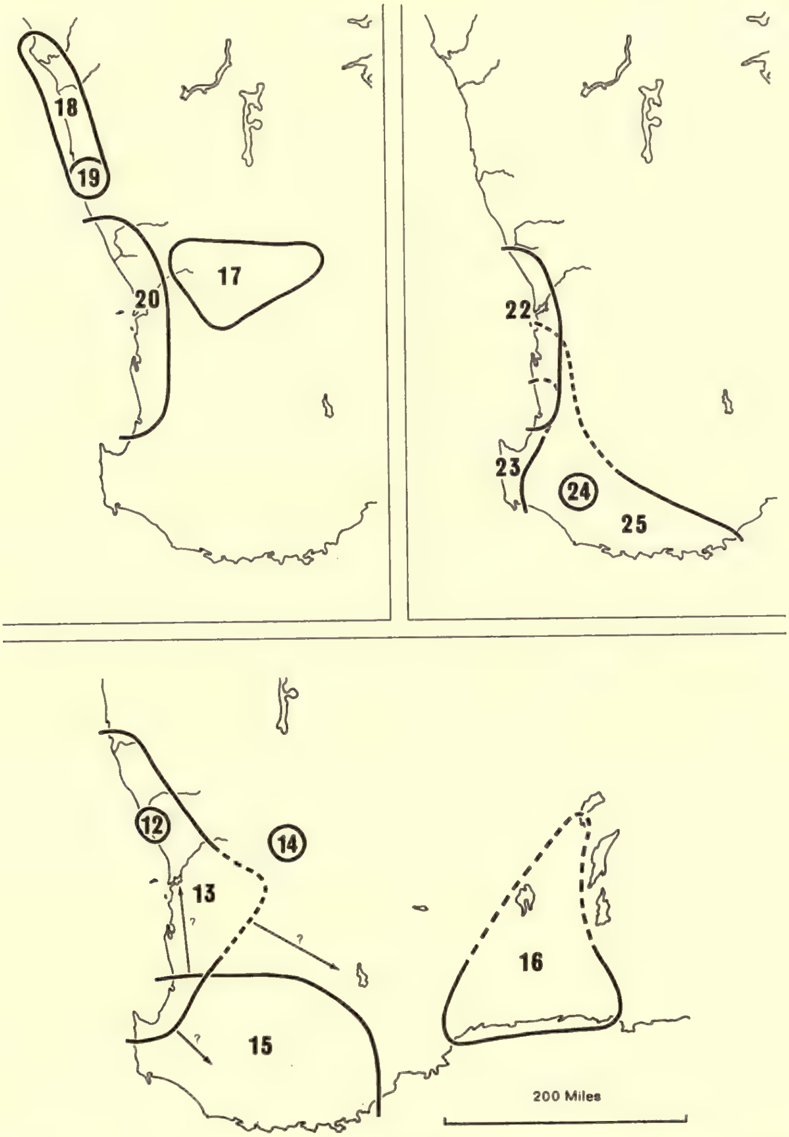
Host-plants: *Jacksonia* sp. (Spencers Brook, 12.iv.1947 (*R. P. McMillan*) (W)).
The head and rostrum of this species are closely similar to those of *C. opimus* but ventrite 5 has no transverse carina and the knees are never entirely black. The name was proposed by Marshall (i. litt.).

## ***Catasarcus opimus*** Pascoe

(Text-figs. 5, 41, Map 3)

*Catasarcus opimus* Pascoe, 1870 : 15, 19.
*Catasarcus ceratus* Pascoe, 1870 : 16, 24, **syn. n.**
*Catasarcus ceratus* Pascoe; Lea, 1909*a* : 156.
*Catasarcus granulatus* Lea, 1909*a* : 156, **syn. n.**
*Catasarcus ceratus* Pascoe; Lea, 1918 : 266.
*Catasarcus granulatus* Lea; Lea, 1918 : 266 [= *ceratus*].

Length 10·2–19·5 mm. Body black, antennae and legs dark red (knees and tarsi black). Scales greenish, whitish or coppery; powdery exudate sometimes present. *Head* and *rostrum* (Text-fig. 5) as in *C. frontalis* but median frontal carina usually more strongly raised and epistome usually convex, merging gradually into the median rostral carina which is sometimes strongly raised. *Antennae* with lengths of funicle segments 1–3 in ratio 2 : 1·36 : 1 (mean of five), 4–7 subequal, shorter than 3. *Prothorax* as in *C. asphaltinus* but broader on average (10 : 17·3–20·7), usually more strongly rugose dorsally and with a larger prosternal callus. *Elytra* of similar proportions in the two sexes (10 : 6·1–7·1) but differing markedly in shape: male with sides strongly and evenly rounded, dorsal surface evenly but less strongly rounded in profile view (appearing somewhat flattened), apex rounded; female subcylindrical, distinctly contracted in apical third, apex acuminate; humeral tubercle small and sharp or obsolete; post-humeral tubercle usually absent; striae usually weakly impressed throughout; strial punctures usually small, often irregular in size, shallow and ill-defined; interstriae flat (or even narrowly sulcate), finely, densely and irregularly granulate throughout; sometimes gaps between strial punctures are raised forming transverse wrinkles which may (if the punctures are large enough) produce an irregular reticulate pattern, the granulation being then suppressed; vestiture more uniform than in *C. asphaltinus* but still dense in strial punctures and (in some females) along middle of each interstria; scales on interstriae flat, appressed, round or ovate-truncate; scales in punctures loose, elongate, thin, curling up at edges, often radiating from point on anterior side of puncture, producing a characteristic fan-like pattern in each puncture. *Legs* as in *C. asphaltinus* but fore femora even more strongly swollen and knees always entirely black; setae very small, pale or dark, inconspicuous; corbel tapering to a point dorsally. *Venter* as in *C. asphaltinus* but ventrites 1 and 2 more strongly granulate; post-coxal cavities deeper in female, narrower in male and with posterior margin drawn up into a large warty prominence; ventrite 5 with a broad transverse fold, prominent in male, reduced (but seldom absent) in female. *Aedeagus* as in *C. asphaltinus*.



Map 3. *Catasarcus* spp. Ranges. 13, *bilineatus*; 14, *sericeus*; 15, *hopei*; 16, *carinaticeps*; 17, *frontalis*; 18, *opimus*; 19, *pallidiventris*; 20, *asphaltinus*; 22, *cygnensis*; 23, *coruscus*; 24, *laevior*; 25, *impressipennis*.

Holotype of *opimus*, ♂, with 'West/Australia' and 'Catasarcus/opimus/*type* Pasc.' in BM(NH). Two further specimens (1 ♂, 1 ♀) have been labelled as paratypes (BM(NH)).

Holotype of *ceratus*, ♂, with 'West Austral' and 'Catasarcus/ceratus/*type* Pasc.' in BM(NH). Unique.

Holotype of *granulatus*, ♂, with 'granulatus/Lea TYPE/Geraldton' in the South Australian Museum, Adelaide.

Paratypes. 1 ♂, with 'granulatus/Geraldton' and 'Co-type' (S); 1 ex. (♀ ?) with 'Geraldton/W. Australia' and 'Co-type' (Macleay).

More than 50 specimens seen.

Localities: Hill River; Geraldton. Type-locality unknown. In spite of several early records for Swan River, I doubt whether this species has ever occurred in the Perth area. Most of the early specimens were collected by F. H. du Boulay who was living near Geraldton at the time (Musgrave 1932 : 72). There is a specimen at Oxford bearing a printed label: 'Fremantle/W. A., J. J. Walker./July, 1901.' but the same label occurs on a series of *C. asphaltinus* in the same Museum, which inclines me to think that the former specimen may have been wrongly labelled. I have also seen a (presumably false) record for Beverley. A specimen labelled: 'Queensland/Challenger Exp./[18]85–44' (BM(NH)) is obviously wrongly labelled, as is one with 'Brisbane' (Dresden).

The scales on the holotype are distinctly golden green, rather than 'golden yellow'; in some other early specimens they are pale grey. The holotype of *C. ceratus* is a bleached specimen (see p. 364). I have confirmed Gahan's report to Lea (Lea, 1909*a* : 156) that Pascoe erred in stating of the funicle 'the second [segment is] as long as the first'; it is in fact × 0·78 as long. The specimen seen by Lea (1918 : 266) is also bleached and bears his label: 'Glairy specimen. Have renamed it *granulatus*. Alas!'

After an interval of over half a century, this species was rediscovered by Dr. Uther Baker in 1962 in the Hill River district. These recent specimens differ from the earlier ones in having pink or coppery scales; the scales in the elytral punctures are less elongate and not obviously curled or in a fan-shaped arrangement in each puncture; the elytral granules are largely suppressed and the prosternal callus is not raised.

## ***Catasarcus pallidiventris* sp. n.**

(Map 3)

Length 13–17 mm. Body black, legs and antennae dark red (tarsi black). Scales mostly pearly, strongly tinged with yellow powdery exudate. *Head* as in *C. carinaticeps* but admedian frontal carinae broader and more strongly raised; scale-tracts in lateral sulci narrower (about as in *C. asphaltinus*) and longer, extending distinctly beyond level of hind margins of eyes; underside rather densely squamose, scales below eye oblong, pearly or iridescent. *Rostrum* as in *C. opimus*, × 1·2 (♂), × 1·17 (♀) as long as broad; scales of same type and colour as on frons. *Antennae* with lengths of funicle segments 1–3 in ratio 2·1 : 1·5 : 1 (mean of eight); scales dense throughout, mostly pale grey-brown on shaft of scape, tending to become pale blue elsewhere or at least on head of scape. *Prothorax* of closely similar proportions in both sexes: ♂, 10 : 16·4–17·6 (mean of five, 17·2); ♀, 10 : 16·6–18·3 (mean of seven, 17·6); sculpture as in *C. opimus* but fine median impressed line present; interstices and other depressions fairly well filled with scales of various sizes. *Scutellum* smooth, bare or with a number of filiform metallic green scales. *Elytra* slightly broader on average than in *C. asphaltinus* (10 : 6·4–6·9) but similarly dimorphic; sculpture variable, intermediate between that of *C. asphaltinus* and *C. opimus*; strial punctures in female of various sizes, disposed in an irregular sequence along each stria, all (except those in stria 7) well filled with scales; interspaces (especially around stria 7) with small ovate greenish scales. *Legs* as in *C. asphaltinus* but setae on femora smaller and knees sometimes darkened (but not black). *Venter* with very large shiny granules on ventrite 1 in male (larger and better defined than in *C. opimus*); ventrite 2 in male and both 1 and 2 in female with smaller granules; post-coxal cavities very large in male but posterior margin not drawn up into a tubercle (cf. *C. opimus*), female with deep post-coxal grooves; scales on ventrites 1 and 2 generally small, narrow, non-imbricate, absent from the large granules on ventrite 1; ventrites 3–5 with imbricate, ovate or somewhat elongate scales almost throughout (stopping short of edges); scales on ventrite 5 disturbed by irregular clusters of white setae; this sclerite sometimes has trace of transverse carina as is normally present in *C. opimus*. *Aedeagus* as in *C. asphaltinus*.

Holotype ♀. WESTERN AUSTRALIA: Hill River, 8.xii.1962 (*F. H. Uther Baker*) in the Western Australian Museum, Perth.

Paratypes. 6 ♂, 8 ♀, same data as holotype (9 FHUB, 2 W, 2 BM(NH), 1 V); 1 ♀, Moore River, 7.xii.1962 (*F. H. Uther Baker*) (FHUB); 1 ♂, with ' W. Australia ' and ' [18]68/20 ' on a blue disc (BM(NH): ' Purchased of Mr. Du Boulay (7/3/68) ').

Total: 17 specimens.

Localities: Hill River. The specimen from Moore River is thought to be wrongly labelled; a series of *C. asphaltinus* with the same data bear a strong superficial resemblance to the specimens of *C. pallidiventris* which were taken on the following day.

## *Catasarcus asphaltinus* sp. n.

(Text-figs. 7, 42, 44, Map 3)

*Catasarcus rufipes* Fåhraeus; Pascoe, 1870 : 16, 22.
*Catasarcus rufipes* Fåhraeus; Lea, 1909*b* : 216.

Length 11–19·5 mm. Body black, antennae and legs dark red (tarsi black). Scales usually sparse, whitish or coppery, mainly in depressions, easily lost; golden yellow powdery exudate sometimes present. *Head* with frons flat, square; lateral frontal carinae strongly raised, sharp and sinuous, curving mesad anteriorly, laterad over eye posteriorly, evanescing where longest diameter of eye cuts dorsal margin; admedian carinae shorter than laterals, rounded, straight and parallel, closer to each other than to laterals but separated by a deep median sulcus; centre of frons with fine longitudinal striations but rarely with any wedge-shaped or cariniform elevation; eyes oblong, almost flat, × 1·9 as long as broad, rounded above, weakly acuminate below; lateral frontal sulci filled with large loose oblong scales and small whitish setae which extend posteriorly to just beyond level of hind margins of eyes and more or less cover anterior ends of admedian carinae; remainder of frons bare; vertex with narrow band of appressed filiform hyaline or metallic scales; underside of head with rather sparse scales of various shapes and sizes (large and dense around laryngeal pit) but usually with only small filiform scales below eye. *Rostrum* × 1·2 (♂), × 1·15 (♀) as long as broad, distinctly widening apically and apex rounded in profile view (Text-fig. 7); epistome flat or evenly concave, strongly pitted and with numerous flanking setae of various sizes; median carina rounded, smooth, more or less strongly arched and somewhat projecting over the very deep transverse furrow; sides of dorsal area strongly raised above antennal insertions, declining evenly to transverse furrow and making a very obtuse angle with frons; oblique basal sulci shallow; dorsal area covered with large loose oblong scales and small whitish setae; a few similar scales below, near base of scrobe; elsewhere bare or with small elongate whitish scales and large hyaline or brownish setae. *Antennae* with lengths of funicle segments 1–3 in ratio 2·1 : 1·5 : 1 (mean of twenty-two), 4–7 subequal, slightly shorter than 3; club fusiform; scape and funicle densely squamose throughout, scales small, oblong-elongate, pale grey. *Prothorax* transverse: ♂, 10 : 15–17 (mean of fifteen, 16·17); ♀, 10 : 16·2–18·6 (mean of twenty-two, 17·56), usually broadest about middle, sides moderately rounded anteriorly, usually weakly rounded or subparallel posteriorly; anterior constriction variable, post-ocular lobes large, evenly rounded or somewhat angular; anterior transverse stria obscure, posterior present towards sides only; anterior border of upper surface fairly even, smooth or microreticulate, with large and small punctures; remainder of upper surface with irregular shiny granules and transverse granuliform wrinkles; interspaces microreticulate or microrugose, matt; vestiture variable but scales dense or imbricate in anterior constriction, on prosternum and above coxae where they form one or more small discrete patches or more extensive tracts; setae as on frons. *Scutellum* with punctures and at least partly microrugose with a few setae and elongate metallic green scales. *Elytra* dimorphic: male elongate-ovate (10 : 5·9–6·5), weakly and evenly convex in profile view, apex rounded; female broader (10 : 6·2–7), more strongly contracted apically, apex acuminate; humeral tubercle basal, small or obsolete in both sexes; post-humeral tubercle just below stria 9, very small and sharp, or obsolete, in both sexes; further tubercles often present in shoulder region and along interstriae 8 and 9; striae weakly impressed throughout; strial punctures variable both in size and degree of definition; interstriae flattened throughout, even on declivity, tightly zigzag or more irregularly deformed by strial punctures, generally uneven or obscurely granulate but surface smooth or very finely rugose, with diffuse punctures; apex, especially in male, finely and strongly rugose, appearing shrivelled; scales usually confined to strial punctures but often most of sides below stria 8 with continuous imbricate scales, especially in female, those on stria 9 extending to apex; setae inconspicuous, white in punctures, brownish elsewhere. *Legs* red-brown, dark red or blackish red according to adult age of specimen at death; tarsi always black dorsally, sometimes also apices of tibiae and parts of coxae; each femur with small black spot (or larger patch) on anterior and posterior faces of knee; fore femora strongly swollen, middle and hind ones less so; fore tibiae somewhat incurved towards apex; all tibiae very weakly bisinuate; tibial teeth small, subequal, except on hind tibiae of male where they are larger, unequal and tuberculiform; posterior (inner) faces of hind femora and tibiae covered with wart-like tubercles; corbels large, with few to many adventitious setae; femora substantially bare but with a few broad scales and numerous very small filiform scales in ill-defined tracts mainly on dorsal and ventral surfaces; tibiae with dense grey or olive-brown scales along dorsal edge and at apex, elsewhere with sparse, mainly elongate metallic scales; tarsi with very dense (but not imbricate) pale grey scales; setae distinct, hyaline, semi-recumbent on femora and tibiae (sometimes dark at apex of both), blackish on tarsi. *Venter* and *thoracic sterna* finely rugose throughout; male with post-coxal cavities broad and deep and ventrites 1 and 2 with discrete shiny granules; female with post-coxal cavities linear or obsolete and granules very small and scattered; scales mainly small or setiform but larger scales present on mesosternal process, mesepisternum, mesepimeron, most of metasternum, metepisternum and often also on central parts of ventrites 1 and 2 and at sides of 3–5. *Aedeagus* (Text-fig. 44) slender, terete, smooth, not or very weakly widening apically, evenly curved; apex blunt, strongly swollen, tip deflexed. *Ovipositor* with valves compressed.

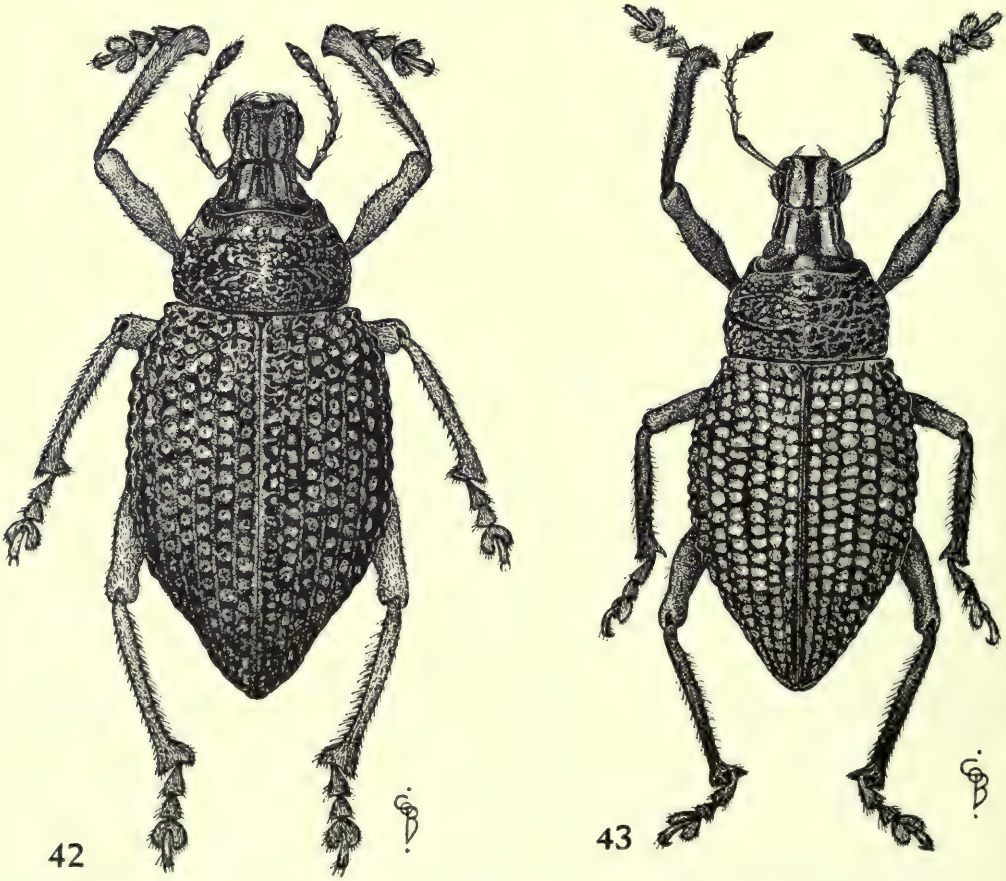
Holotype ♂. WESTERN AUSTRALIA: Fremantle, 1953 (*E. C. Chapman*), B. M. 1954–78, in the Western Australian Museum, Perth.

Paratypes. 8 ♂, 15 ♀, same data as holotype (15 BM(NH), 3W, 3V, 2S); 2 ♂, 5 ♀, ditto but 1956 and B.M. 1957–71 (BM(NH)); 1 ♂, 6 ♀, same locality, 1879 (*Dr.*

*Legge*); 7 ♀, same locality, vii.1901 (*J. J. Walker*) (all Oxford); 4 ♂, 3 ♀, ditto but without date, *via G. C.* Champion coll. (BM(NH)); 2 ♂, same locality, i.1946 and 24.xii.1948 (*F. H. Uther Baker*) (FHUB); 3 ♀, ditto but without date (V); 1 ♀, same locality, viii.1953 (*H. Demarz*) (Frey); 1 ♂, 3 ♀, same locality, 1614, 1612, 1613, 1645, all [18]91–49 (BM(NH)); 1 ♂, 1 ♀, East Fremantle, 7.i.1948 (*F. H. Uther Baker*); 1 ♀, ditto but 14.i.1948; 1 ♂, ditto but 20.i.1948; 2 ♂, ditto but 10.x.1948; 1 ♀, ditto but iii.1949 (all FHUB); 1 ♂, same locality, 10.x.1948 (*F. H. Uther Baker*) (A); 2 ♂, 2 ♀, Perth, 11.xi.1933 (*R. A. Lever*); 1 ♂, 1 ♀, same locality, 18.ix.1923 (*G. A. K. Marshall*); 1 ♂, same locality, 1–7.ii.1914 (*R. E. Turner*); 1 ♂, 1 ♀, ditto but 5–9.xi. 1935 and 10–18.ii.1936 (all BM(NH)); 1 ♂, 2 ♀, same locality, ix.1953 (*Demarz*) (2 Frey, 1 BM(NH)); 31 ♂, 31 ♀, Perth district, x.1954 (*H. Demarz*) (57 Frey, 3 V, 2 BM(NH)); 1 ♂, 1 ♀, ditto but xii.1953 (Frey); 1 ♂, 1 ♀, same locality, viii (*Mjöberg*); 1 ♀, same locality, K 13461 (all A); 1 ♂, 3 ♀, same locality, i.1939 (*F. E. Wilson*) (FEW); 3 ♂, same locality, 6.ix.1912 (*G. H. Hardy*); 1 ♂, same locality, 1900 (*K. J.*); 1 ♂, South Perth; 1 ♂, 3 ♀, Mount Yokine, 15–16.xii.1956 (*I. M*[*urray*]); 1 ♂, ditto but 8.xii.1956; 1 ♀, ditto but 27.i.1958; 1 ♂, 2 ♀, Wembley, 20.x.1956 (*I. M*[*urray*]); 2 ♀, ditto but 10.xi.1957 (all V); 2 ♂, King's Park, 27.iii.1957 and 17.vi.1957 (*L. Lai*); 1 ♂, same locality, 4.ix.1959 (*K. J. Betjaman*); 1 ♀, same locality, 3.x.1956 (*L. Muhling*); 1 ♀, same locality, 20.iv.1953 (*Bornemissza*) (all UW); 1 ♀, same locality, 17.viii.1912 (*G. H. Hardy*); 1 ♀, Nedlands, 9.xi.1912 (*G. H. Hardy*) (both V); 2 ♀, same locality, vi.1941 and 3.viii.1941 (*D. Sandars*); 1 ♀, same locality, 11.iv.1948 (*J. W. Shield*); 1 ♀, East Guildford, 13.vii.1941 (*D. Sandars*); 1 ♂, 1 ♀, Crawley, iii.1955 and iii.1957; 1 ♂, same locality, 17.x.1956 (*L. Muhling*); 1 ♀, same locality, 14.v.1946 (*K. H. Ooi*); 1 ♂, 2 ♀, Mount Lawley, 16.ix.1953, 4.xi.1954 and 9.xi.1954 (all *J. Cohen*); 2 ♂, 1 ♀, Melville, 11.xii.1958, 20.xii.1958 and 12.x.1959 (*W. Lane*); 1 ♂, Leederville, 4.i.1955 (*K. H. Ho*); 1 ♀, Floreat Park, 13.x.1954 (*G. Anastas*); 1 ♂, West Swan, 18.vi.1956 (*P. Bailey*); 1 ♂, Cottesloe, 21.x.1953 (*T. Lee*); 1 ♂, same locality, 30.ix.1956 (*P. Bailey*) (all UW); 1 ♀, same locality, 16.i.1962 (*J. Daid*) (NSWAg); 1 ♂, same locality, 3.viii.1908 (*G. E. Bryant*) (BM(NH)); 1 ♂, Claremont, ii.1910 (V); 1 ♂, Subiaco, 12.v.1923 (*S. Thomas*) (A); 1 ♀, Maida Vale, 31.viii.1946 (*R. P. McMillan*) (W); 2 ♂, 1 ♀, Applecross, 12.xii.1958 (*F. H. Uther Baker*); 1 ♂, ditto but 1.iii.1959 (all FHUB); 1 ♂, Midland Junction, 23.xi.1957 (*I. M*[*urray*]) (V); 1 ♀, Kenwick, 1960/1961 (*H. Demarz*) (Frey); 1 ♀, near Kenwick, 20.vii.1960 (*H. Demarz*) (Munich); 1 ♀, Jandakot, 30.xi.1947 (*F. H. Uther Baker*) (FHUB); 2 ♀, Maylands (*J. Clark*) (BM(NH)); 3 ♂, 2 ♀, Swan River (*Lea*) (3 BM(NH), 2 Dresden); 1 ♂, 2 ♀, same locality (*L. J. Newman*) (2 (BM(NH), 1 UW); 1 ♂, same locality (*Baly*); 1 ♀, same locality (*J. Clark*); 1 ♀, same locality (*De Boulay*), *via* A. Fry coll. (all BM(NH)); 4 ♂, 9 ♀, same locality (no further data) (7 BM(NH): 3 D. Sharp coll., 2 F. P. Pascoe coll., 2 A. Fry coll.; 1 Stockholm: Chevrolat coll.; 1 Macleay: Masters coll.); 1 ♂, Wanneroo, 3.xi.1935 (*R. E. Turner*); 1 ♂, same locality, 17.ix.1905 (*H. M. Giles*) (both BM(NH)); 13 ♂, 16 ♀, 2 mls. W. of Bullsbrook, 13.xii.1961 (*E. B. Britton* and *A. Douglas*) (25 BM(NH), 4 W); 2 ♀, Gingin; 1 ♀, same locality, 11.ii.1904 (*H. M. Giles*) (all BM(NH)); 1 ♂, same locality, 13.ix.1959 (*F. H. Uther Baker*) (FHUB); 4 ♂, 3 ♀, Yanchep, 13–23.xi.1935 (*R. E. Turner*); 1 ♂, 1 ♀, ditto but 3–19.xii.1935 and 24.xi–2.xii.1935; 1 ♀, ditto but

1–7.i.1936 (all BM(NH)); 1 ♀, same locality, 7.xii.1962 (*F. H. Uther Baker*) (FHUB); 3 ♂, 4 ♀, Moore River, 7.xii.1962 (*F. H. Uther Baker*) (4 FHUB, 3 BM(NH)); 1 ♀, Lancelin, 7.xii.1962 (*F. H. Uther Baker*) (FHUB); 1 ♂, 7 ♀, Geraldton (*J. Clark*) (6 BM(NH), 2 S); 1 ♀, same locality (no further data) (BM(NH)); 2 ♀, same locality, 15.viii.1926 (BM(NH)); 1 ♂, Mullewa (*Miss F. May*) (S); 1 ♂, Baandee, 11.iii.1918 (V); 1 ♂, Jubuk, vi.1952 (UW); 1 ♀, ' Harvey Ag. Area ', K 10849; 1 ♂, 2 ♀, K 38841, K 10849, K 38842 (no further data) (all A); 1 ♂, 1 ♀, Bunbury, 1–20.x.1958 (*A. Snell*) (A); 9 ♂, 9 ♀, without precise localities (various collections) (11 BM(NH), 3 A, 2 Stockholm, 1 Macleay, 1 Oxford). Total: 326 specimens.

Localities: Perth area; Wanneru; Bullsbrook; Yanchep; Gingin; Moore River; Lancelin; Harvey; Bunbury. The records listed above for Geraldton and Mullewa are regarded as dubious; those for Baandee and Jubuk are probably false as are others, not listed, for King George Sound (*Spence*); Queensland (Sharp and Fry colls.) (all BM(NH)); Stanthorpe, Q. (NSWAg); Sydney, N.S.W., 1958, 1960 (*Nikitin*); New Castle, N.S.W. (all Frey); South Africa (*Dr. Smith*), [18]44–6 (BM(NH)).



FIGS. 42, 43. 42, *Catasarcus asphaltinus* sp. n. ♀. 43, *C. longicornis* Pascoe ♂.

Host-plants: *Casuarina* sp. (Perth, Maida Vale, 31.viii.1946 (*R. P. McMillan*) (W)); *Banksia* sp. (Perth, Cottesloe, 16.i.1962 (*J. Daid*) (NSWAg)). This species is reported as a minor pest in gardens in the Perth area (E. B. Britton, personal communication).

Immature stages. Some observations on these have recently been made by Mrs. P. Sundstrom of Tuart Hill, Perth (personal communication). She found a weevil larva, $\frac{1}{2}$ in. long, pale grey/pink in colour, attached by its jaws to the tap root of a eucalypt sapling 8 in. below the soil surface, near her home. This larva is stated to be identical with first instar larvae of *C. asphaltinus* obtained from captive females. Mrs. Sundstrom describes the eggs as: ' small globular cluster $\frac{1}{2}$ in. beneath soil . . . Cluster contains 12 to 14 eggs $\frac{1}{16}$ in. × $\frac{1}{20}$ in. White, smooth in texture, cylinder shape rounded at each end. Adhering together with clear sticky fluid '.

This species exhibits considerable variation in size, shape (within each sex, in addition to the elytral dimorphism) and scaling. The lateral frontal carinae vary in degree of curvature and sharpness while the admedian carinae are sometimes abnormally enlarged. The femoral setae vary in size and degree of erectness; in some of the specimens from Bullsbrook they are particularly large and stiff. The scales in this species are very easily lost; the majority of specimens appear quite bare dorsally. A few abnormally densely squamose specimens have been recorded in the Perth area; these often have a narrow sutural stripe covering less than half of the width of interstria 1. Specimens from more northerly localities have progressively denser scales, especially on the venter; those from Moore River and the one from Lancelin resemble *C. pallidiventris* in this respect.

## ***Catasarcus longicornis*** Pascoe

(Text-fig. 43)

*Catasarcus longicornis* Pascoe, 1870 : 16, 20.
*Catasarcus longicornis* Pascoe; Lea, 1918 : 266.

Length 10·5–13·2 mm. Body black, shiny; antennae and legs dark red (tarsi black). Scales rather sparse, greyish white or pink. *Head* with frons distinctly convex; lateral frontal carinae sharp, almost straight and shorter than in *C. asphaltinus* owing to reduction of posterior outward flexure; admedian carinae very short, quickly merging with frons posteriorly but higher than laterals in profile view; median frontal sulcus widening posteriorly; middle of frons with a few fine longitudinal striations; lateral sulci narrowly filled with scales which extend to level of hind margins of eyes but (probably) do not cover admedian carinae. *Rostrum* as in *C. asphaltinus* but median carina more strongly raised and epistome with fewer flanking setae. *Antennae* with lengths of funicle segments 1–3 in ratio 2·2 : 1·37 : 1 (mean of four), 4 and 7 longer than 5 and 6. *Prothorax* transverse (10 : 16·7–17·4) and resembling that of *C. asphaltinus* in all respects. *Scutellum* with punctures and several elongate metallic blue or whitish scales. *Elytra* ovate-acuminate (10 : 6·7–7·0), less convex in male than in female but not as flattened as in *C. asphaltinus*; humeral and post-humeral tubercles usually obsolete or very small; other small round tubercles or raised granules present in shoulder region; striae weakly impressed throughout; strial punctures large, encroaching upon the interstriae which become irregularly zigzag with occasional raised granules near base but without wrinkles or evident punctures; strial punctures filled with scales of same type and arrangement as in typical *C. opimus*; in male, interstriae link up between each puncture producing a reticulate pattern but in the only female available the links are weak and the scales confluent along each stria as in *C. frontalis*. *Legs* and *underside* much as in *C. asphaltinus* but femora with relatively larger, denser scales (especially ventrally) and granules on ventrite 1 larger and more numerous. *Aedeagus* as in *C. asphaltinus*.

Holotype ♂, with ' West/Australia ' and ' Catasarcus/longicornis/*type* Pasc.' in BM(NH).

Paratype ♂, with ' Champion B. ' (BM(NH)). Pascoe's supplementary collection contains two males from Champion Bay and one female without precise locality. Five specimens seen.

Localities: ? Geraldton.

The species referred to by Lea as ' common about the Swan River, which I have long had as *hopei* ', is probably *C. cygnensis*, which somewhat resembles *C. longicornis* superficially.

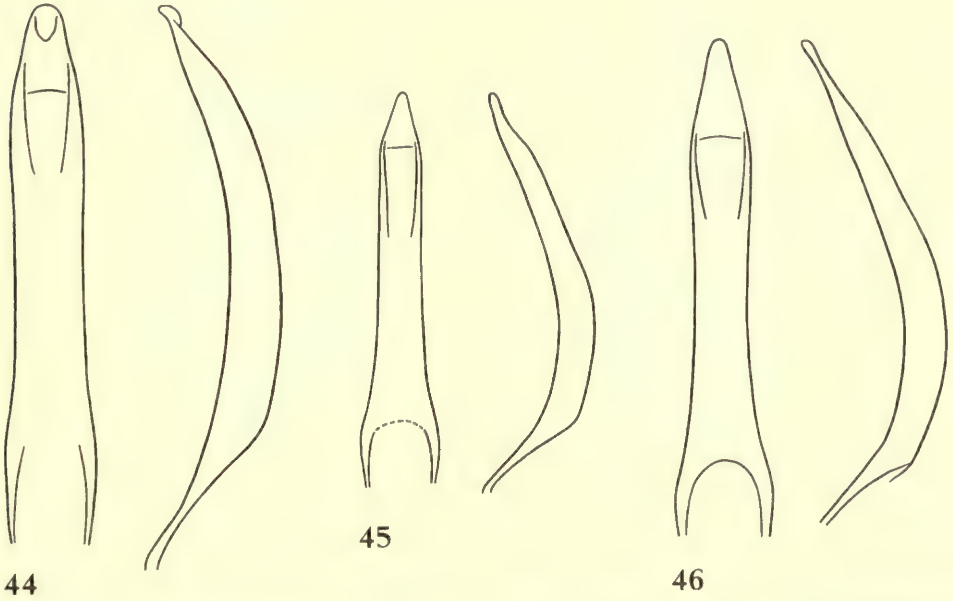
## *Catasarcus cygnensis* sp. n.

(Text-figs. 45, 47, Map 3)

Length 8·2–14 mm. Body black, antennae and legs dark red or red-brown (tarsi black). Scales whitish or pearly; whitish or pale yellow powdery exudate present. *Head* with frons weakly convex; frontal carinae variable, usually subequal in length; laterals straight or curved, sharp or rounded (rarely almost obsolete), weakly to strongly converging anteriorly; admedian carinae broader, straight or curved, closer to laterals than to each other (equidistant anteriorly); centre of frons smooth or finely striate, rarely with any median elevation; lateral sulci narrow, deep to very shallow, filled with round or ovate scales; admedian carinae sparsely covered with smaller ovate scales; underside of head with large ovate appressed scales around laryngeal pit and sparse small elongate scales elsewhere. *Rostrum* × 1·2–1·3 (♂), × 1·1–1·2 (♀) as long as broad, scarcely widening apically; epistome triangular, irregularly pitted, microreticulate, disc often strongly depressed and a single tuft of 2–3 flanking setae on either side; median carina weakly to strongly raised and usually arched; dorsal area usually subrectangular; lateral sulci deep, filled with large ovate scales (smaller beside epistome); oblique basal sulci sometimes very large. *Antennae* with lengths of funicle segments 1–3 in ratio 2·3 : 1·6 : 1 (mean of nine), other segments as in *C. asphaltinus*. *Prothorax* transverse (10 : 15·8–17·6), sides weakly and evenly rounded, only moderately converging anteriorly; post-ocular lobes well developed, somewhat angulate and with relatively long white vibrissae; dorsal surface weakly rugose or finely but obscurely granulate and with scattered punctures; sides more strongly granulate but seldom with discrete raised granules; anterior transverse stria usually obsolete, posterior present towards sides only; underside and sides with ovate, often imbricate scales which often encroach (less densely) on dorsal surface; latter otherwise bare or with small filiform scales; setae hyaline. *Scutellum* smooth, with scattered punctures (often confined to base) and a few very small filiform scales. *Elytra* ovate in male (10 : 6·3–6·8) and with declivity oblique; in female suboblong, slightly broader on average (10 : 6·6–6·9) and with declivity vertical; humeral tubercle absent or obsolete (rarely well developed); post-humeral tubercle very small or obsolete; striae weakly impressed throughout; strial punctures on disc equal in size and regular in arrangement; interstriae of equal width, convex, weakly sinuous and segmented, sometimes with narrow trans-strial links but rarely with continuous folds; strial punctures filled with round or oblong scales which cover sides beyond stria 8 (at least in anterior half) and form continuous tracts along striae posteriorly; setae in and around punctures white and fairly conspicuous, those along interstriae brown and inconspicuous. *Legs* with tarsi black or very dark (colour obscured by scales in fresh specimens); knees sometimes darkened; femora distinctly swollen; fore tibiae incurved very near apex, middle and hind tibiae usually straight; tibial teeth very small but 1–3 large teeth often present on hind tibiae of male; corbels with a few (usually 2–4) adventitious setae; femora and ventral edges of tibiae with numerous small filiform scales; dorsal edges of tibiae with dense ovate hyaline scales; tarsi densely squamose; setae large and hyaline on femora and tibiae, dark on tarsi. *Venter* and *thoracic sterna* finely rugose; ventrites 1–4 strongly granulate in male, weakly so in female; post-coxal cavities small but often fairly deep in male, shallow or obsolete in female; entire venter and most of meso- and metasternum with dense ovate semi-erect white scales and numerous whitish setae; many (rarely all) scales on venter elongate and closely resembling the setae but ventrite 5 almost always with some large ovate scales on disc. *Aedeagus* (Text-fig. 45) strongly tapering and strongly curved in basal third, thereafter very slender, straight and parallel-sided to phallotreme; apical region evenly tapering, tip narrow, weakly swollen, not at all deflexed.

Holotype ♂. WESTERN AUSTRALIA: Applecross, 5.x.1965 (*F. H. Uther Baker*) in the Western Australian Museum, Perth.

Paratypes. 1 ♂, same data as holotype but ix.1964 (FHUB); 3 ♂, 2 ♀, Swan River (4 V, 1 S); 3 ♂, 3 ♀, same locality (*J. Clark*) (4 BM(NH), 2 V); 2 ♂, same locality (*L. J. Newman*); 1 ♀, same locality, A. Fry coll.; 1 ♂, same locality, [18] 44–105 (all BM(NH)); 1 ♀, same locality, 1869 (*de Boulay*); 3 ♂, 2 ♀, same locality (no further data) (all Oxford); 2 ♀, Perth, 2–4.xi.1935 (*R. E. Turner*); 2 ♀, ditto but 5–9.xi.1935; 1 ♂, ditto but 25.ii–12.iii.1936; 1 ♀, same locality, 17.ix.1923 (*G. A. K. Marshall*); 4 ♂, ditto but 18.ix.1923; 2 ♂, same locality, 11.ix.1933 (*R. A. Lever*) (all BM(NH)); 2 ♀, same locality, x.1913; 1 ♀, same locality (*J. Clark*) (all S); 1 ♂, 4 ♀, same locality, ix.1953 (*H. Demarz*) (4 Frey, 1 BM(NH)); 1 ♂, same locality,



FIGS. 44–46. *Catasarcus* spp. Aedeagus in dorsal and lateral view. 44, *C. asphaltinus* sp. n. 45, *C. cygnensis* sp. n. 46, *C. impressipennis* (Boisduval).

1902 (*A. G. Hamilton*) (NSWAg); 1 ♂, 2 ♀, Perth area, xii.1953 (*H. Demarz*) (2 Frey, 1 BM(NH)); 10 ♂, 15 ♀, ditto but x.1954 (21 Frey, 3 BM(NH), 1 California); 3 ♀, Fremantle, viii.1953 (*H. Demarz*) (2 Frey, 1 BM(NH)); 1 ♀, Mount Yokine, 15.xii. 1956 (*I. M[urray]*); 1 ♀, Kings Park, 8.xi.1947 (*A. B[urns]*) (both V); 1 ♂, 1 ♀, same locality, 35–621 and 35–1070 (W); 1 ♂, 1 ♀, same locality, x.1956 (*R. Williams*); 1 ♀, same locality, 10.viii.1954 (*G. Anastas*); 1 ♀, same locality, 8.viii.1954 (*J. Cohen*); 1 ♂, same locality, 11.ix.1954 (*L. E. Koch*); 1 ♀, same locality, 5.iv.1957 (*L. Lai*); 1 ♂, same locality, x.1952 (*Bornemisssza*); 1 ♀, Leederville, 9.xi.1955 (*K. H.*); 1 ♂, Dalkeith, x.1957 (*C. M. Puder*) (all UW); 1 ♂, 1 ♀, West Perth, viii.1937 (*R. P. McMillan*) (W); 1 ♀, South Perth, 21.x.1902 (*H. M. Giles*); 1 ♂, 1 ♀, same locality (no further data); 2 ♂, 1 ♀, Fremantle (*J. J. Walker*); 2 ♂, 2 ♀, same locality, [18] 91–49 (one with label in Marshall's hand: ' J. J. Walker, H. M. S. Penguin Nov. 1890 ') (all BM(NH)); 1 ♀, same locality, 1879 (*Dr. Legge*) (Oxford); 2 ♂, Peel Estate, 2.ix.1951 (*F. H. Uther Baker*); 1 ♂, 1 ♀, ditto but 3.ix.1951; 1 ♀, ditto but 12.i.1952; 4 ♀, ditto but 1.i.1954 (7 FHUB, 2 BM(NH)); 1 ♀, Jandakot, 49–1027 (W); 1 ♀, same locality, 30.xi.1947 (*F. H. Uther Baker*) (FHUB); 1 ♀, Jandicot, 6.iv.1946 (*K. H.*) (UW); 1 ♂, Forestdale, 32–2682 (W); 1 ♂, 3 ♀, Darling Ranges (*Lea*) (2 S, 1 V, 1 Dresden); 1 ♀, Mandurah (V); 1 ♀, Pinjarrah (*Lea*) (S); 4 ♀, Bunbury, 4.xi.1948 (*F. E. Wilson*) (FEW); 1 ♂, 3 ♀, Yanchep, 7.xii.1962 (*F. H. Uther Baker*) (2 FHUB, 2 BM(NH)); 1 ♂, 1 ♀, Moore River, 7.xii.1962 (*F. H. Uther Baker*) (BM(NH), FHUB); 1 ♀, Geraldton (*J. Clark*); 1 ♂, no locality, Bowring coll.; 1 ♂, ditto, Pascoe coll.; 1 ♀, ditto, Fry coll.; 1 ♂, 2 ♀, ditto, Marshall coll. (all BM(NH)); 1 ♀, ditto, Chevrolat coll. (Stockholm); 1 ♂, ditto, Tylden coll.; 2 ♀, ditto, Hope coll. (one with segments 3 and 4 of both antennae fused together) (all Oxford). Total: 141 specimens.

Localities: Perth and environs; Yanchep; Moore River; Jandakot; Forrestdale; Mandurah; Pinjarra; Bunbury. The single record for Bunbury requires confirmation; that for Geraldton is probably false.

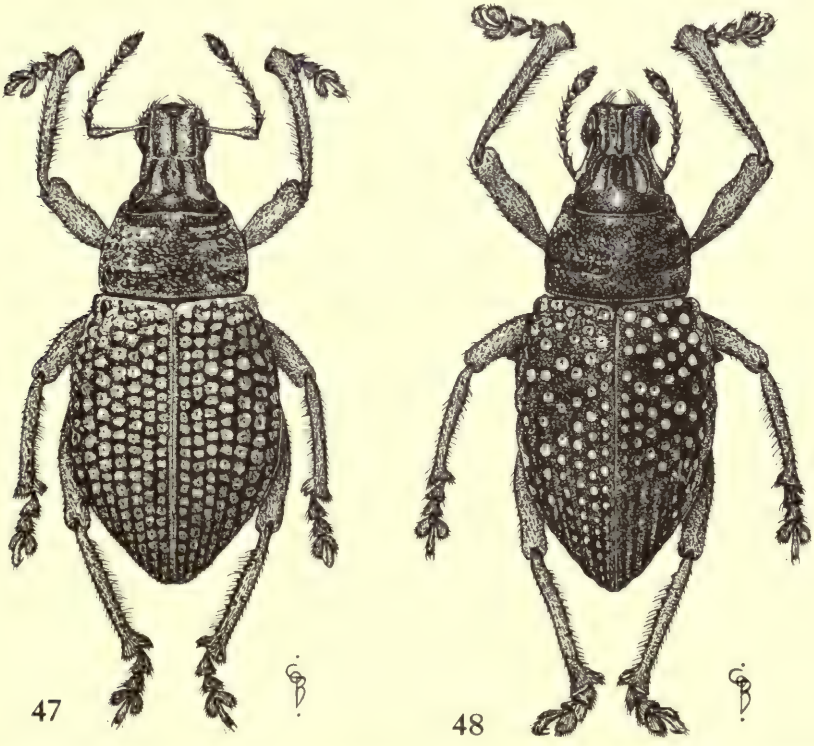
Host-plants: *Casuarina* sp. (Perth, 18.ix.1923 (*G. A. K. Marshall*) (BM(NH)); *Xanthorrhoea* sp. (Darling Ranges (*Lea*) (S)).

This species is notable for the extremely pale colour of its powdery exudate (when fresh). The name was proposed by Marshall (i. litt.).

### *Catasarcus coruscus* sp. n.

(Map 3)

Length 9·1–14·3 mm. Body black, legs and antennae dark red. Scales pearly white (sometimes greenish or coppery); setae hyaline; pale yellow powdery exudate sometimes present. *Head* with frons weakly to moderately convex; lateral frontal carinae raised, fairly sharp, straight or at most weakly curved or sinuous and distinctly converging anteriorly; admedian carinae at least as long as laterals, usually narrow (sometimes very broad), straight, parallel or weakly converging anteriorly, often higher than laterals and then weakly arched; all four carinae usually equidistant from one another; median sulcus very deep anteriorly; centre of frons (between admedian carinae) with longitudinal striations or one or more narrow carinulae (sometimes without either); lateral sulci deep and narrow, widening posteriorly and filled with round or ovate scales which extend posteriorly at least to level of hind margins of eyes and cover ends of admedian carinae anteriorly; underside with large patch of imbricate oblong scales below eye; similar but less dense scales also present around laryngeal pit. *Rostrum* of same proportions as in *C. cygnensis*, weakly widening apically; epistome as in *C. cygnensis*; median carina broadly rounded to rather sharp, smooth and level anteriorly, weakly raised posteriorly; dorsal area usually subrectangular, sulci usually deep, with large ovate or oblong scales very dense at base and over oblique basal sulci but rarely extending beyond. *Antennae* with lengths of funicle segments 1–3 in ratio 2·16 : 1·5 : 1 (mean of seven), 4–6 progressively shorter, 7 ≏ 3 or 4 and about × 1·3 as long as broad. *Prothorax* transverse (10 : 16·3–18), sides straight or weakly rounded and parallel or weakly converging anteriorly in male, distinctly rounded and converging in female; post-ocular lobes as in *C. cygnensis*; dorsal surface very weakly to strongly rugose or obscurely granulate, usually with discrete raised granules at sides; transverse striae variable, sometimes strongly marked; most of underside with large imbricate scales which extend along anterior constriction and along sides to hind angle; similar scales (often mixed with small elongate ones) sometimes form an ill-defined tract along hind margin and two admedian patches anteriorly but dorsal surface often bare; setae hyaline. *Scutellum* smooth (sometimes rugose at base) with a few fine punctures and filiform scales. *Elytra* ovate in male (10 : 6·3–7) oblong-ovate in female (10 : 6·8–7·2); humeral tubercle variable, rounded, usually basal, rarely very large and cariniform; post-humeral tubercle usually small, sharp and strongly reflexed posteriad, mounted on a low broad bulge; striae and punctures either as in *C. impressipennis* (but with punctures more regular) or with striae more strongly impressed and interspaces more strongly raised, interstriae often segmented and the segments uniting to form weak irregular transverse



FIGS. 47, 48. 47, *Catasarcus cygnensis* sp. n. ♀. 48, *C. impressipennis* (Boisduval) ♂.

folds (in both sexes); scales dense in punctures (which are often distinctly pupillate), along striae on declivity and continuously imbricate along sides beyond stria 8 (except in apical third); very small ovate or elongate scales sometimes present around punctures, along suture and at apex; setae very inconspicuous except sometimes on declivity. *Legs* as in *C. cygnensis* but tarsi red; hind femora (only) in some fresh specimens with an ovate patch or elongate tract of large scales along both dorsal and ventro-lateral aspects in distal half; corbels usually bare but sometimes with 1–4 adventitious setae. *Aedeagus* as in *C. cygnensis* but tip slightly broader and very weakly deflexed.

Holotype ♂. WESTERN AUSTRALIA: Yallingup, [19]45–771, in the Western Australian Museum, Perth.

Paratypes. 2 ♂, 2 ♀, same data as holotype but 45–772 to 45–775; 1 ♂, 2 ♀, ditto but 44–689, 44–690 and 42–633 (all W); 1 ♂, 2 ♀, same locality, 14.ix–31.x.1913 (*R. E. Turner*); 1 ♂, 1 ♀, ditto but 1.x.1913; 2 ♂, ditto but xi.1913; 1 ♂, ditto but 1–12. xii.1913; 1 ♂, 1 ♀, ditto but 23.xii.1913–23.i.1914 (all BM(NH)); 1 ♂, same locality, 1.x.1951 (*I. F. B. Common*) (CSIRO); 6 ♂, 4 ♀, Dunsborough, 42–230 to 42–239; 1 ♂, 3 ♀, East Witchcliffe, 45–507 to 45–510; 1 ♂, 2 ♀, Calgardup, 40–1600, 40–1601 and 40–1598; 1 ♀, Forest Grove, 34–1707; 1 ♀, Busselton, 47–301 (all W); 1 ♂, 1 ♀, Busseltown, 17.iii.1957 (*A. Snell*); 2 ♀, Cape Naturaliste, 6.iii.1958 (*A. Snell*); 1 ♀, Bunbury, 13.i.1957 (*A. Snell*) (all V); 4 ♂, 5 ♀, Karridale, ii.1959 (*H. Demarz*) (6 Frey, 3 BM(NH)); 3 ♂, 1 ♀, same locality, 24.i.1950; 1 ♂, 1 ♀, ditto but 22.i.1965; 1 ♂, Yelverton, 13.x.1962; 1 ♂, Meelup, xi.1953; 1 ♂, Augusta, xii.1952 (all *F. H. Uther Baker*) (all FHUB); 1 ♂, Kudardup, 23.i.1965 (*F. H. Uther Baker*) (BM(NH)); 2 ♂, Ludlow (*J. Clark*); 1 ♂, Yarloop, 8.xi.1948 (*F. E. Wilson*) (all FEW); 2 ♂, 2 ♀, Swan River (*L. J. Newman*); 1 ♂, same locality (*J. Clark*); 1 ♂, 1 ♀, Albany (*J. Clark*); 1 ♂, Champion Bay, Pascoe coll. (all BM(NH)). Total: 73 specimens.

Localities: Augusta; Kudardup; Calgardup; Karridale; Forest Grove; Witchcliffe; Yelverton; Yallingup; Cape Naturaliste; Meelup; Dunsborough; Busselton; Ludlow; Bunbury; Yarloop. The records for Swan River and Albany are probably false and that for Champion Bay certainly is.

This species exhibits an astonishing range of variation in the sculpture of the elytra, especially in the male. At one extreme the disc of the elytra is flat, with large round scale-filled punctures and no trace of striae, while at the other the striae are deeply impressed throughout, the interstriae convex (segmented or not) and the punctures reduced, their scales coalescing along the striae.

A specimen in the Hope collection (Oxford) (Plate 1, Fig, 5), at first regarded as a distinct species, is now thought to be an extreme variant of this species. The striae are impressed throughout and the interstriae strongly convex, smooth and shiny, for the most part straight or weakly sinuous, increasing in width towards the sides. The strial grooves are uniformly filled with mostly small scales which all but obscure the punctures in striae 1–5; those in striae 6 and 7 are much larger and encroach upon the very broad interstria 7, making the latter strongly sinuous. The elytral sculpture of the Kudardup specimen is intermediate between that of the Oxford specimen and the other paratypes. The Oxford specimen resembles *C. coruscus* in other respects except that the prothorax is narrower (10 : 15·8) and the aedeagus is parallel-sided in the middle (weakly constricted there in *C. coruscus*). It measures 12 × 5·6 mm. and bears no contemporary labels.

### *Catasarcus laevior* sp. n.

(Map 3)

Length 9·6–13·3 mm. Body black, antennae and legs dark red (coxae black). Scales usually greenish white but sometimes golden or coppery, especially ventrally; setae pale except on tarsi and elytra; yellow-brown powdery exudate present. *Head* as in *C. impressipennis*. *Rostrum* × 1·1–1·2 (♂), × 1–1·1 (♀) as long as broad, distinctly widening at genae; epistome usually flat; otherwise as in *C. impressipennis*. *Antennae* with lengths of funicle segments 1–3 in ratio 2·5 : 1·7 : 1 (mean of three), 7 slightly longer than 6 but only × 1·1 as long as broad. *Prothorax* as in *C. impressipennis* but dorsal surface less strongly, less regularly and less distinctly granulate (sometimes almost smooth on disc); sides with a prominent irregular tract of imbricate scales; underside with a discrete elongate patch above coxa (sometimes very small). *Elytra* less elongate than in *C. impressipennis*: 10 : 6·5–6·7 (♂), 10 : 6·8–7·2 (♀); humeral tubercle obtuse, often obsolete; post-humeral tubercle small to moderate in size, often strongly reflexed posteriad; a few small sharp granules present at sides between humeral and post-humeral tubercles; striae impressed throughout in both sexes; punctures larger towards sides but not as irregular as in *C. impressipennis*; interstriae smooth on disc, finely rugose on declivity, usually strongly convex, sinuous and weakly segmented posteriorly, elsewhere linking up across striae to form a reticulum; punctures filled with scales which are continuous along middle section of interstriae 9 and 10; interstriae with scattered small brown squamiform setae (larger and more numerous on declivity). *Legs* as in *C. impressipennis* but tibial teeth distinctly larger; corbels usually with a few adventitious setae. *Underside* as in *C. impressipennis* but scales (as elsewhere) larger and hence more conspicuous. *Aedeagus* as in *C. impressipennis*.

Holotype ♂. WESTERN AUSTRALIA: Manjinup [Manjimup], 24.x.1952 (*H. F. Broadbent*), B. M. 1953–106, in the Western Australian Museum, Perth.

Paratypes. 2 ♂, 7 ♀, same data as holotype (7 BM(NH), 1 W, 1 V); 1 ♂, same locality, [19]35–3049 (W). Total: 11 specimens.

Host-plants: *Leptospermum* sp. (main series).

### *Catasarcus impressipennis* (Boisduval)

(Text-figs. 4, 46, 48, Map 3)

*Cneorhinus impressipennis* Boisduval, 1835 : 350; pl. 7, fig. 9.
*Cneorhinus stygmatipennis* Boisduval, 1835 : 349, **syn. n.**
*Catasarcus rufipes* Fåhraeus in Schönherr, 1840 : 814.
*Catasarcus stigmatipennis* (Boisduval) Schönherr, 1840 : 818 [Invalid emendation].
*Catasarcus impressipennis* (Boisduval) Schönherr, 1840 : 818.
*Catasarcus rufipes* Schönherr; Labram and Imhoff, 1848, No. 27; fig.
*Catasarcus impressipennis* (Boisduval); Lacordaire, 1863 : 250 (note) [ = *rufipes*].
*Catasarcus stigmatipennis* (Boisduval); Pascoe, 1870 : 18.
*Catasarcus pollinosus* Pascoe, 1870 : 16, 23, **syn. n.**
*Catasarcus foveatus* Pascoe, 1870 : 16, 24, **syn. n.**
*Catasarcus maculatus* Pascoe, 1870 : 16, 25, **syn. n.**
*Catasarcus mollis* Lea, 1909*a* : 157, **syn. n.**
*Catasarcus durus* Lea, 1909*a* : 158, **syn. n.**
*Catasarcus pollinosus* Pascoe; Lea, 1918 : 265 [ = *maculatus*].

Length 9·7–16·6 mm. Body black, legs and antennae red or dark red. Scales greenish white or golden yellow (metallic or not), small and sparse except in elytral punctures and there usually obscured by yellow powdery exudate; setae pale. *Head* with frons weakly to strongly convex; lateral frontal carinae (Text-fig. 4) strongly raised, rather sharp, strongly curved (if only weakly curved then strongly converging); admedian carinae as long as laterals, broad, rounded, often swollen anteriorly, usually weakly to very strongly curved, at least outwardly; median sulcus opening widely posteriorly; centre of frons smooth or with longitudinal striations or sometimes with a smooth median elevation; lateral sulci deep and narrow, especially anteriorly, and filled with ovate or ovate-elongate scales (at least posteriorly); underside of head with ovate scales around laryngeal pit and very small scattered filiform scales elsewhere. *Rostrum* × 1·2–1·3 (♂), × 1·1–1·2 (♀) as long as broad, distinctly widening apically; epistome triangular, disc flat or concave, sometimes strongly so (posterior margins then cariniform); two or three flanking setae in a puncture on each gena; median carina rounded, not or weakly raised, level or weakly arched; dorsal area subrectangular, lateral sulci usually deep, with at most a few ovate and very small elongate scales posteriorly in region of oblique basal sulci which are variably developed or obsolete. *Antennae* with lengths of funicle segments 1–3 in ratio 2·3 : 1·5 : 1 (mean of seven), 4–6 < 3, subequal; 3 and 7 subequal, 7 about × 1·25 as long as broad. *Prothorax* transverse (10 : 15·2–17·4), subcylindrical in some males, broadest at or near base in female with converging, weakly rounded sides; anterior constriction weak, post-ocular lobes well developed, sometimes angulate, upper surface and sides finely, densely and uniformly granulate, appearing matt to the unaided eye in strong contrast with the shiny elytra; individual granules on disc often grossly mis-shapen or with a large eccentric setiferous puncture; those at sides more regular, less dense, interspaces microrugose and with numerous micrograpules; anterior transverse stria obscure or absent, posterior present at sides only; entire dorsal surface usually bare but some fresh specimens with very small elongate greenish scales scattered throughout; larger ovate golden scales on prosternum, along anterior constriction and sometimes on sides and at hind angles. *Scutellum* variable (sometimes obsolete), usually with dense shallow punctures and a few filiform scales. *Elytra* ovate-elongate in male (10 : 5·8–6·5), evenly rounded at sides, sometimes only × 1·3 as wide as prothorax; in female, more broadly ovate (10 : 6·4–7), more strongly rounded posteriorly and with somewhat steeper declivity; humeral tubercle variable, basal, often obsolete; post-humeral tubercle small, sharp, reflexed posteriad; male usually with striae impressed on declivity only, surface elsewhere quite even, smooth or finely rugose, strial punctures round, very small near suture, becoming much larger and fewer towards sides and very irregular in size and arrangement (in same individual) (Text-fig. 48); female usually similar (punctures less irregular) but often striae impressed throughout and interspaces convex, forming a reticulate pattern; scales dense in strial punctures, interspaces (including sides) bare, or (in fresh specimens) with a few small elongate greenish scales; setae very small and very inconspicuous except sometimes on declivity. *Legs* unicolorous; femora weakly swollen; fore tibiae distinctly, middle tibiae weakly, incurved towards apex, hind tibiae straight but ventral edge weakly sinuous; all tibial teeth very small; corbels usually bare, only rarely with a few adventitious setae; femora bare or sometimes with sparse very small elongate scales; tibiae with similar and larger hyaline scales, mostly along dorsal edge and at apex; tarsi with similar small scales, nowhere really dense; setae large and pale (dark on tarsi). *Venter* and *thoracic sterna* finely but strongly rugose throughout; ventrites 1–4 in male with a few small flat granules, much smaller still in female; post coxal cavities fairly large in male, linear or obsolete in female; scales confined to mesosternal process, mesepisterna, mesepimera (usually), metepisterna and narrow tracts across metasternum and ventrite 1 (following transverse impressions on these sclerites) and along anterior border of ventrite 2; elsewhere with exceedingly small and inconspicuous filiform scales or bare (apart from setae). *Aedeagus* (Text-fig. 46) smooth, terete, strongly curved and tapering in basal half; straight apically, weakly widening around phallotreme; ventral surface flattened, dorsal surface strongly convex; apical region weakly and evenly tapering; tip broad, swollen, evenly rounded or subtruncate, not deflexed.

The following specimens are in the Muséum National d'Histoire Naturelle, Paris:

Holotype of *impressipennis*, ♀, with ' Durville, P. G. R.' [Port du Roi-George (= Albany)] under a round label [x.1826]. Unique.

Holotype of *stygmatipennis*, ♂, with ' Durville, P. West ' [Western Port, near Melbourne] under a round label. Unique.

The following specimens are in the Naturhistoriska Riksmuseum, Stockholm:

Holotype of *rufipes*, ♀, with ' *Polyd*: ? *rufipes*/Hope./Swan Rivier./N. Holl: Hope'. and ' Typus '. There is also a male specimen in the Schönherr collection labelled ' N. Holl./Hope '.

The following specimens are in BM(NH):

Holotype of *pollinosus*, ♀, with ' West/Australia ' and ' Catasarcus/pollinosus/*type* Pasc.' There are two similar specimens from the Pascoe coll. (one slightly larger than the holotype, the other smaller), each bearing a ' cotype ' label.

Holotype of *foveatus*, ♂, with ' Champion B.' and ' Catasarcus/foveatus/*type* Pasc.' Unique.

Holotype of *maculatus*, ♂, with ' King/George's Sound '. Pascoe's determination label is missing. His series label (' Catasarcus/maculatus Pasc.') was, however, attached to the specimen when it was removed from his cabinet and the locality is unique among his *Catasarcus*. There can be little doubt, therefore, that this is the specimen that Pascoe described.

The following specimens are in the South Australian Museum, Adelaide (unless otherwise stated):

Holotype of *mollis*, ♀, with ' mollis/Lea TYPE/Mt. Barker ' [*R. Helms*]. Paratype, ♀, with ' mollis/Albany ' and ' Cotype ' [*R. Helms*].

Holotype of *durus*, ♀, with ' durus/Lea TYPE/Mt. Barker ' [*A. M. Lea*].

Paratypes: 2 ♀, with ' durss/Mt. Barker ' and ' Co-type ' (1 Macleay).

Over 300 specimens seen.

Localities: Albany; Taylor Inlet; Kalgan; Cheyne Beach; Youngs; Denmark; Nornalup; Mount Barker; Mount Groper. Apparently genuine records have been seen for the following localities, though they are widely separated from the main group: Jubuk; Quindalup; Yunderup; Cardup. More doubtful records have been seen for Kalgoorlie and Norseman and a large number of patently false records, including Geraldton, Kojarena, Eradu, Western Port, Melbourne, Brisbane, Wallangarra, Hobart, New Guinea, Fiji Is. It is clear from the foregoing that the true range of this species remains to be determined.

Host-plants: *Acacia* sp. (Quindalup, i.1963 (*R. P. McMillan*)(W)); *Xanthorrhoea* sp. (Cardup, 25.x.1952 (*H. F. Broadbent*) (BM(NH))).

I am greatly indebted to Dr. G. Kuschel for finding the types of Boisduval; the following information (and that given in the type-citations above) is taken from his notes. *C. impressipennis*: 12·6 × 5·2 mm.; in normal condition; legs and antennae almost black. *C. stygmatipennis:* 11·5 × 5·2 mm.; completely sand-blown.

The false locality given for this second specimen, together with its bleached condition, no doubt led Boisduval to regard it as distinct. Lacordaire, who implies that he saw the specimens, also thought they were distinct, though he correctly recognized *C. rufipes* Fåhraeus as a synonym of *C. impressipennis* (Fåhraeus had *not* seen Boisduval's types).

Pascoe accepted Lacordaire's conclusions but misidentified a specimen of *C. asphaltinus* as *C. rufipes*; the (correct) locality of his specimen—Swan River—is the (false) type-locality of *C. rufipes*. Although he was unable to recognize *C. stygmatipennis* in 1870, there was a series-label for it in his collection (now attached to a fresh(!) specimen of *C. impressipennis*). He too may have been misled by the false type-locality given for *C. stygmatipennis*; the specimens which he described as *C. pollinosus* are strongly bleached and must closely resemble the holotype of *C. stygmatipennis* which was clearly described by Boisduval as ' supra cinerascens ' and 'en entier d'un gris-ardoisé mat, plus foncé en dessous qu'en dessus '. The holotype of *C. foveatus* is a somewhat abraded specimen with dark legs; that of *C. maculatus* is very fresh and has bright red-brown legs. Apart from a very slight difference in elytral sculpture, these specimens are very similar.

Lea's observations on *C. pollinosus* are correct and he even suggests that it may be a synonym of *C. impressipennis*. In the next paragraph, however, he quite wrongly sinks *C. memnonius* as a synonym of *C. transversalis* and adds: ' I am also convinced that it is the *Cneorhinus stigmatipennis* of Boisduval . . . ' In the absence of any explanation as to how this conclusion was reached, I can only assume that Lea accepted the false type-locality of *C. stygmatipennis* as genuine and thought that as there was (in his opinion) only one species of *Catasarcus* in eastern Australia, then that described from Western Port must be it. Unfortunately, the nearest genuine record of *Catasarcus* known to me is from a point about 140 miles west of Western Port. This is a fair indication that the locality given for *C. stygmatipennis* is false and since the only other landfall made by the ' Astrolabe ' in Australia was at King George Sound, this must be the true type-locality. Having established this, the identity of both Boisduval's species is clear. *C. impressipennis* is certainly the commonest member of the genus in the area—' The species occurs in abundance at King George Sound and near same ' (Lea, 1918 : 265) and bleached specimens are particularly frequent (about 10% of collected specimens).

The two species described by Lea in 1909 are based exclusively upon large, or very large, female specimens, two of which are teneral and three mature and abraded. It is hardly surprising, therefore, that Lea failed to equate them with Pascoe's species (though he does mention several points of similarity). What is surprising is that he described two species from the material, including specimens from the same locality in each and that he relied for their separation upon a wholly spurious character, namely the hardness of the cuticle (hence the specific epithets used). Anyone acquainted with the rudiments of entomology knows that the cuticle of otherwise hard insects remains thin and soft for an appreciable time after emergence from the pupa. Although it is true that there is some variation in the final thickness of the cuticle within the present genus (and that of *C. impressipennis* is especially thick), it is nevertheless unlikely that closely related species will differ *markedly* in this respect. It is worth noting that *typical, male* specimens were taken at Albany by Helms and on Mount Barker by Lea.

## *Catasarcus inaequalis* sp. n.

(Plate 1, Figs. 3, 4)

Length 15–16·5 mm. Body black, legs and antennae dark red. Large whitish (pearly or greenish) scales mainly confined to depressions on elytra; pale brown powdery exudate sometimes present. *Head* as in *C. impressipennis* but with no large scales on underside. *Rostrum* × 1·2–1·3 as long as broad, weakly widening apically and with scarcely any chin ventrally; epistome with disc depressed, microreticulate, and with several flanking setae; median carina broad, smoothly rounded, level, not projecting over transverse furrow, which is narrow, sinuous and rather less deep than in related species; sides of dorsal area broadly rounded and strongly raised, level with median carina; without any large scales but with numerous very small filiform scales forming a kind of general pubescence. *Antennae* with lengths of funicle segments 1–3 in ratio 2 : 1·65 : 1 (mean of three), 6 and 7 as long as broad, 7 distinctly larger than 6; club fusiform, very little broader than segment 7 of funicle; scape and funicle throughout with filiform hyaline scales. *Prothorax* transverse (10 : 16·1–17·3), broadest at or near base; sides subparallel or weakly converging basally, weakly rounded anteriorly; anterior constriction weak, post-ocular lobes very large, evenly rounded; dorsal surface and sides strongly and evenly rugose-granulose, anterior border finely rugose and pitted almost to anterior margin; anterior transverse stria confused, posterior well developed, almost complete; basal marginal stria distinct; large scales confined to region of anterior constriction and a narrow vertical area above coxa; elsewhere with very small filiform scales and small setae. *Scutellum* smooth or finely rugose, with scattered punctures and a few filiform scales. *Elytra* elongate-ovate (10 : 6·2–6·5); humeral tubercle strictly basal, small in male, moderate in female, blunt; post-humeral tubercle small or obsolete; striae distinctly to strongly impressed, especially posteriorly; interstriae either weakly convex and almost smooth, or strongly convex and finely but strongly rugose, 7 much broader than all the others for almost its entire length, 5, 8 and apical part of 9 all usually broader than others; strial punctures mostly large, uniform, filled with large scales except for a central pupil (often plugged with exudate); scales coalesce along certain striae to form stripes, notably 6, 7–9 and apical part of 3; these stripes may also fuse together laterally, thus, in the holotype, most of interstria 6 and apical parts of 4 and 8 are covered with scales; scales on striae 1 and 2 are strictly confined to punctures throughout (almost absent on declivity), so that this region appears as a dark median tract between the pale, striped outer areas; setae generally hyaline (brown on declivity), numerous among scales, sparse elsewhere, about as large as those on prothorax. *Legs* unicolorous, including coxae; femora moderately swollen; fore tibiae and ventral edge of hind tibiae weakly bisinuate, teeth very small; corbels large, bare or with a rather large number of small adventitious setae; vestiture throughout consisting of very small filiform scales and moderate hyaline setae (brownish on tarsi). *Venter* and *thoracic sterna* with similar vestiture to that of legs, large scales confined to lateral part of mesepisternum and greater part of metepisternum (apart from a small number on metasternum in depression behind middle coxa); venter with discrete shiny granules throughout (poorly developed in female); post-coxal cavities cavernous in male, virtually absent in female. *Aedeagus* similar to that of *C. impressipennis* but rather strongly sulcate ventrally near base; single example examined has extensive dorsal sulcus but this may be abnormal.

Holotype ♂. 'W. Aus.' (Chevrolat collection) in Naturhistoriska Riksmuseum, Stockholm.

Paratypes. 1 ♂, with 'W. Australia' and '[18]47/109' ['Purchased of George Clifton']; 1 ♀, without locality (*Baly*), with 'Bowring./[18]63.47*' (both BM(NH)).

It will be noted that the above three specimens were all collected, apparently separately, more than a century ago.

## ***Catasarcus memnonius*** Pascoe, **sp. rev.**

(Text-figs, 12, 49, 55, Map 1)

*Catasarcus memnonius* Pascoe, 1870 : 16, 26.
*Catasarcus stigmatipennis* Boisduval; Lea, 1918 : 265 [Erroneous synonymy].

Length 7·7–11·3 mm. Body black and shiny; legs and antennae very dark red-brown or black. Upper surface devoid of scales; setae brown, those on elytra small and inconspicuous. *Head* with transverse furrow reduced to a sinuous or angulate impressed line (sometimes ill-defined); frons flat, without distinct carinae, sides angular or rounded and irregularly carinulate, weakly converging anteriorly; median sulcus distinct, well defined, usually narrow but with an exceedingly fine micro-carina along the bottom; underside with numerous round white scales but only a few very small ones below eye; eyes usually distinctly convex and about × 1·4 as long as broad. *Rostrum* × 1·4–1·5 as long as broad, weakly widening apically, genae sharply angled (viewed from above); epistome coarsely pitted, sometimes ill-defined, disc depressed, anterior lobes red-brown, right lobe larger than left, two (apparently one) principal flanking setae in a puncture on either side and two or more very small setae in anterior cleft; median rostral carina sharp, tectiform, raised posteriorly, weakly arched and weakly to strongly punctured; oblique basal sulci usually well developed, rendering posterior end of median carina acuminate; underside with scattered scales. *Antennae* with lengths of funicle segments 1–3 in ratio 2·2 : 1·5 : 1 (mean of four), 7 slightly longer than 3 and about × 1·4 as long as broad; scape and funicle with small dense whitish scales. *Prothorax* transverse (10 : 17·8–19·5), broadest about middle or near base; sides rounded, weakly converging anteriorly; post-ocular lobes well developed; anterior transverse stria irregular and usually interrupted in mid-line by an ill-defined cariniform elevation; posterior stria obscure or reduced to a short impression near either side; sides with discrete smooth raised granules which become lower and obscure towards disc; interspaces usually strongly microreticulate or microrugose; underside finely and strongly rugose with small patch of large white scales above coxa. *Scutellum* finely punctured, bare. *Elytra* subglobular (10 : 7·4–8·5); humeral tubercle usually small, sharp; post-humeral tubercle small to fairly large, conical, usually sharp; striae strongly impressed except at sides and apex; disc with sinuous undulating transverse folds, somewhat as in *C. transversalis*; strial punctures on disc obscure, elsewhere very small; interstriae 3, 5 and 7 strongly convex over brow of declivity and each with a row of raised granules (Text-fig. 12) (one granule opposite each adjacent strial puncture interval); similar granules in humeral region and sometimes a few on interstriae 2, 4, 6 and 7; surface almost smooth and brilliant at sides, elsewhere shiny but very finely punctured or microrugose, rarely with a few scales at extreme apex. *Legs* slender, femora scarcely swollen; fore tibiae strongly, middle tibiae weakly, incurved towards apex, teeth small; corbels narrow, filled with dense long golden setae; claw-segment of hind tarsi × 1·1 (♂), × 1·1–1·2 (♀) as long as segments 2 + 3 (overall); femora with at most a few small scales at apex; tibiae and tarsi densely squamose throughout. *Venter* and *thoracic sterna* finely rugose or microreticulate; mesosternum coarsely and densely pitted, intercoxal process broad, often sulcate; ventrites 1 and 2 with a few scattered granules in male only; white or pink scales imbricate on mes- and metepisterna and mesepimera, scattered on mesosternum and sides of metasternum, absent elsewhere. *Aedeagus* (Text-fig. 49) short and broad, strongly curved, strongly and evenly depressed; sides parallel (widening around phallotreme); apex very short, very broadly rounded; tip thin, not deflexed. *Ovipositor* with valves explanate, depressed and weakly divergent.

Holotype ♀, with ' Adelaide ' and ' Catasarcus/memnonius/*type* Pasc.' in BM(NH). Probably unique. Two smaller, male, specimens from Pascoe's main collection, one with ' Adelaide ', the other with ' S. Australia ', may be paratypes and have been so labelled by Marshall and Arrow respectively.

A total of 13 specimens seen.

Localities: Kopperamanna (60 miles E. of Lake Eyre) (S). This record was made by a [South Australian (?)] Museum expedition in 1916. A further six specimens were taken on 26.vi.1927 by G. Horne in ' Central Australia ' (V). Pascoe's record for Adelaide is probably very imprecise. In his paper he erroneously gives ' Victoria ' as the type-locality. The remaining specimens (1 BM(NH), 1 Washington) are without locality data.

*C. memnonius* is probably the most isolated species in the genus, both geographically and anatomically; the condition of the frons and more especially the extreme reduction of the transverse rostral furrow mark this species off from all the rest. It also has the most elongate rostrum and the longest hind tarsal claw-segment (in relation to segments 2 + 3) of any known species and the genuinely asquamose upperside is unique. Although itself spineless, the explanate ovipositor suggests a closer affinity with the spiny than non-spiny species. The densely squamose corbel resembles that of the quadrispinate *C. intermedius* which also has a rather shallow transverse rostral furrow (though it is furthest from *C. memnonius* geographically). The granules on the declivity of the elytra (Text-fig. 12) have no parallel in the spineless species and may indicate an incipient multispinose condition.

## NOTE ON THE QUADRISPINATE SPECIES

Lea (1897 : 591) regarded all the seventeen quadrispinate species described by Pascoe (1870) as synonyms of *C. spinipennis* Fåhraeus. In fact, only two of them are, though of the remaining fifteen names, eight are synonyms and one is of doubtful status. Pascoe described one species no fewer than seven times, thereby demonstrating the truth of his own remark (p. 15) that ' this is one of those genera which prove how much more difficult it is to determine the limits of species than the limits of genera '. The *spinipennis*-group (*C. spinipennis*, *C. nephelodes*, *C. echidna* and *C. albuminosus*) has proved especially difficult to deal with, in spite of the fairly large amount of material available. About a dozen specimens have been seen which clearly belong to this group but do not match up with any of the four species here recognized; two, or possibly three forms are involved but in no case is the material adequate for description.

A character which has proved useful in separating the quadrispinate species is the anterior spine index (described above, p. 368):

| | ♂ | ♀ |
|---|---|---|
| *C. intermedius* Pascoe | 52–59 | 54–62 |
| *C. albipectus* sp. n. | 45–47 | 47–54 |
| *C. bicolor* sp. n. | 42–46 | 55·6 |
| *C. echidna* Pascoe | 32–37 | 44–49 |
| *C. nephelodes* sp. n. | 41–45 | 46–49 |

| | | |
|---|---|---|
| *C. albuminosus* Pascoe | 37–40 | ? |
| *C. spinipennis* Fåhraeus | 42–49 | 49–55 |
| *C. marginispinis* Pascoe | 45–49 | 49–53 |
| *C. albisparsus* Pascoe | 48–53 | 49–53 |
| *C. cicatricosus* Pascoe | 47–52 | 47–53 |
| *C. carbo* Pascoe | 43–49 | 49–54 |

It will be seen that in some species the index-ranges of the two sexes do not overlap, while in others they overlap almost completely.

## ***Catasarcus intermedius*** Pascoe

(Text-fig. 13, Map 4)

*Catasarcus intermedius* Pascoe, 1870 : 16, 27.

Length 6·3–10·3 (–12) mm. Black, shafts of femora and dorsal elytral spines very dark red, antennae and tibiae blackish red. Scales fairly dense throughout, mostly white or pearly; setae mostly brown. *Head* with frons usually quite flat and often with parallel supra-ocular carinae but frontal carinae all small and usually subdivided, hence more or less indistinct; smooth median frontal carina often present between eyes, usually very small but sometimes large; eyes × 1·4 as long as broad, smaller and more strongly convex than in *C. spinipennis*; behind eye a distinct but ill-defined groove with concentric accessory striae; frons smooth or finely microreticulate, with fairly dense large round white or pearly scales and erect strongly curved brown setae; underside of head with dense, mainly oblong scales throughout. *Rostrum* × 1–1·2 as long as broad, progressively widening apically; epistome more or less flat, strongly pitted, with scattered setae and (posteriorly) small ovate scales; median carina narrow, usually quite level (sometimes raised at extreme base); transverse furrow shallower than in all other quadrispinate species, hence median carina and hind corners of dorsal area not, or but weakly, projecting posteriorly over it; oblique flange above scrobe smaller than in other species and with longitudinal cariniform swelling (often very ill-defined); scales as on head; setae slender, white or hyaline. *Antennae* with lengths of funicle segments 1–3 in ratio 3 : 1·3 : 1 (mean of eight); club stouter than in other quadrispinate species (2 : 1); scape and funicle with imbricate grey scales throughout. *Prothorax* transverse (10 : 15–17·5), broadest before middle; sides straight, parallel or weakly converging posteriorly; anterior constriction deep; post-ocular lobes prominent and sharply angulate; transverse striae both complete and very strongly impressed but rather irregular; dorsal surface (behind anterior stria) very uneven and strongly but irregularly granulate; sides with even stronger but more regular granules; scales fairly dense, some white or grey (sometimes in ill-defined patches) mixed with bronzy scales of similar size; setae small and brown. *Scutellum* not, or not abruptly raised above general level of mesonotum (adjacent portions of elytra hence depressed); surface punctured, usually covered with small ovate scales. *Elytra* shortly ovate-acuminate (10 : 7·2–7·7); humeral tubercle usually obsolete in male, moderate to large in female; a smaller granule often present at base of interstria 5; post-humeral bulge usually with large recurved tubercle (rarely with small spine); dorsal spines as in *C. spinipennis* but smaller and set further back (see table, p. 423 and Text-fig. 13); anterior and posterior spines × 0·5–1 and × 1·4–1·7 respectively as long as broad in male, × 0·5–0·8 and × 0·8–1·1 respectively in female (breadth measured at extreme base); all spines in female and anteriors in male tapering evenly to a point, posteriors in male subcylindrical in basal half, tapering apically; all spines distinctly reflexed posteriad; striae distinctly impressed; interstriae strongly raised opposite gaps between punctures, forming high undulating transverse folds as in *C. transversalis*; shoulder region with numerous round or somewhat irregular granules, sometimes strongly raised; scales dense but more or less confined to depressions, white or pearly but sometimes brown locally; setae distinct, hyaline or brownish.

*Legs* as in *C. spinipennis* but setae brown throughout and corbels filled with a dense mass of adventitious setae; claw-segment of tarsi × 0·8 as long as 2 + 3 in male, × 0·9 as long in female. *Underside* densely and fairly evenly squamose; setae white or brownish. *Aedeagus* similar to that of *C. spinipennis*, convex above (sometimes flattened in mid-line), convex to distinctly concave below; surface below phallotreme smooth or irregular, sides smooth or irregularly rugose, upper surface usually microreticulate towards base; apex rather long, fairly evenly tapering; tip rounded, flat, weakly deflexed. *Ovipositor* short, valves strongly depressed apically.

Holotype ♂, with ' Champion B.' and ' intermedius ' in BM(NH).

Paratype ♂, with ' Champion B.' (BM(NH)).

A total of 42 specimens has been seen.

Localities: North West Cape; ' Between Carnarvon Distr. and N.W. Cape '; Carnarvon. The first of these records is based upon a series of 36 exx. (21 ♂, 15 ♀) taken by A. M. Douglas on 25.vii.1963 (31 W, 5 BM(NH)), the second upon a very large female taken by D. G. Stead in 1929 (A) and the third upon a male taken by Dr. Uther Baker (FHUB). The published type-locality is probably false. Two further specimens are known, both determined by Pascoe, one from his supplementary collection and bearing a printed label: ' Champion Bay? ', the other from the Fry collection, with ' De Boulay ' and ' Swan R.' This last locality is certainly false (see under *C. echidna*, p. 430).

A distinctive species, not readily confused with any other. It also has the most northerly range. It is worth noting, however, that the two principal series available show slight but constant differences in sculpture, etc. the significance of which can only be assessed when more material becomes available.

## ***Catasarcus albipectus* sp. n.**

(Text-figs. 14, 15, Map 4)

Length 7·2–13 mm. Prothorax very dark red (not obvious to unaided eye); head and rest of body, including elytral spines, black; legs and antennae dark to blackish red. Scales very sparse dorsally, dense ventrally, forming a brilliant white lateral stripe on thorax; yellow-brown powdery exudate present. *Head* as in *C. spinipennis* (vestiture excepted); median frontal carina always present but variable in size; eye × 1·4 as long as broad. *Rostrum* as in *C. spinipennis* (vestiture excepted). *Antennae* with lengths of funicle segments 1–3 in ratio 2·9 : 1·4 : 1 (mean of six); scape and funicle densely squamose. *Prothorax* transverse (10 : 14·7–16·7), broadest about middle; sides weakly rounded, weakly converging or subparallel posteriorly, more strongly converging anteriorly but not, or not strongly, constricted; post-ocular lobes distinct, with relatively long whitish vibrissae; transverse striae weak but complete or nearly so (posterior sometimes obsolete); dorsal surface uneven or obscurely granulate and finely rugose or micropunctate, often with scattered moderate punctures containing stout, conspicuous setae; sides distinctly granulate. *Scutellum* variably developed, punctate, sometimes squamose; scutellar area of mesonotum usually with pale elongate or filiform scales. *Elytra* ovate-acuminate (10 : 6·8–7·6); humeral tubercle absent or obsolete in male, moderate sharp basal and directed obliquely anteriad in female; post-humeral bulge very rarely with small spine, usually with small sharp tubercle but even this often obsolete in male; anterior dorsal spines (Text-figs. 14, 15) tapering evenly to a point in both sexes; posterior spines cylindrical and very long in male, subcylindrical or tapering and shorter in female, × 1·3–1·8 and × 1·9–3

(4 × mean diameter) as long as broad in male, × 0·7–1·2 and × 1·3–1·6 as long in female; striae impressed weakly in female (distinctly on declivity), not at all in male (except sometimes on declivity); disc even or with weak transverse folds in male, female with stronger folds and often with raised granules in shoulder region and at base of interstriae 2, 3 and 5; entire surface microgranulate or microrugose. *Legs* as in *C. spinipennis* (vestiture excepted) but claw-segment of tarsi shorter, × 0·7 as long as 2 + 3 in male, × 0·9 as long in female. *Venter* as in *C. spinipennis* (vestiture excepted).

*Vestiture* of dorsum in male very sparse, composed of small grey and larger yellowish scales scattered thinly over pronotum and elytra, on latter mostly confined to punctures especially below dorsal spines, denser and duller on declivity, denser larger and brighter towards costa where they flank the brilliant ventro-lateral stripe; head and rostrum with similar yellowish scales, very dense in and around transverse rostral furrow; setae large, white or yellowish, those on frons between eyes very long, semi-recumbent, directed posteriad; those on pronotum shorter, recumbent, mostly directed mesad; those on elytra very small, but distinct, white or brown. Underside of head with elongate pearly scales, imbricate below eye, becoming less dense mesally; prothorax below sides (but above coxae), greater part of mesepisternum, mesepimeron, metepisternum and adjacent part of metasternum all with a very compact covering of strongly imbricate very large oblong brilliant white scales (with pearly lustre), together forming a prominent white stripe; similar but less compact scales on intercoxal process of mesosternum and (narrowly) on costal margin of elytra (rarely also on interstria 8 above hind coxa in female); sides of mesosternum and adjacent part of mesepisternum bare smooth and shiny; prosternum, metasternum and venter with dense loose pearly scales, tinted by yellow-brown powdery exudate; setae white, semi-erect, large and conspicuous on venter; femora with similar large setae and numerous small round appressed hyaline or grey scales, often with a blue reflection; tibiae and tarsi with narrower, mostly brown setae and dense pale grey scales, convex and tessellate on tibiae towards apex. Vestiture of female denser and paler above; scales on tibiae and heads of femora tessellate or very dense throughout; otherwise as in male.

*Aedeagus* similar to that of *C. spinipennis*; flat or sulcate dorsally, strongly and evenly convex ventrally, smooth; apex variable, tip flat, rounded, weakly deflexed. *Ovipositor* with valves strongly depressed, explanate.

Holotype ♂. WESTERN AUSTRALIA: Murchison River, [19] 49–1090, in the Western Australian Museum, Perth.

Paratypes. 6 ♂, 4 ♀, same locality, 49–1088, 49–1089, 49–1091 to 49–1098 (8 W, 2 BM(NH)); 5 ♂, same locality, ix.1954 (*F. H. Uther Baker*) (4 FHUB, 1 UW); 5 ♂, 2 ♀, ditto but ix.1956 (5 FHUB, 2 W); 1 ♀, ditto but 18.ix.1960 (FHUB); 9 ♂, 6 ♀, ditto but 21.ix.1960 (11 FHUB, 3 BM, 1V); 1 ♀, ditto but 29.ix.1960 (BM(NH)); 2 ♀, same locality, ix.1954 (*A. Douglas*); 2 ♂, ditto but ix.1956 (all W); 1 ♂, 1 ♀, '1½ m. N. Murchison Mouth', 66–414, 66–415 (*R. Humphries*) (W); 1 ♂, 1 ♀, Murchison River Reserve, 24.ix.1960 (*F. H. Uther Baker*) (FHUB); 1 ♂, Kalbarli [Kalbarri], 25.ix.1960 (*F. H. Uther Baker*) (FHUB); 1 ♂, without locality (Dresden); 1 ♂, 1 ♀, ditto, ex W. Tylden coll. (Oxford); 1 ♂, ditto, ex A. Fry coll. (30851) (BM(NH)). Total: 52 specimens.

Localities: Around the mouth of the Murchison River.

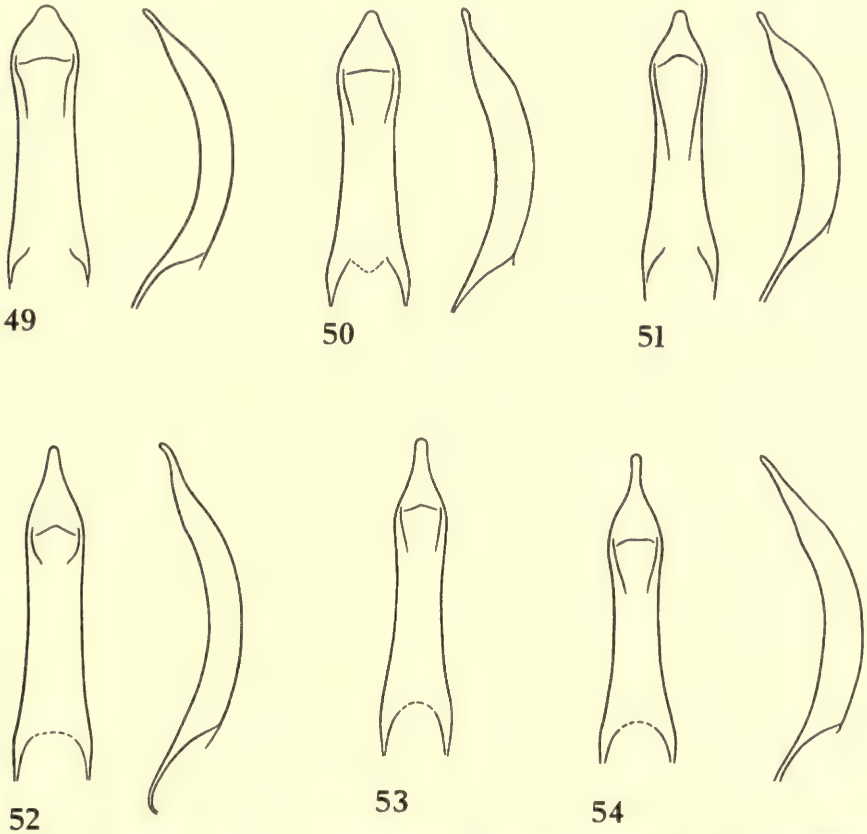
Host-plants: *Acacia rostellifera* (Murchison River, ix.1956 (*A. Douglas*) (W)).

Easily distinguished from all other quadrispinate species (except the following) by the red pronotum and the very long, cylindrical, posterior dorsal spines of the male, which are combined with an extreme reduction of the post-humeral spine. The overall sex ratio shows a predominance of males by 33 : 19 (1·74 : 1).

## ***Catasarcus bicolor*** **sp. n.**

(Map 4)

Length 7·8–8·5 mm. Pronotum, antennae and legs dark red; head and rest of body, including elytral spines, black. Scales generally sparse dorsally (except on head) but elytra with small white lateral flash and other markings; dense ventrally and with white ventro-lateral stripe as in *C. albipectus*; yellow-brown powdery exudate present. *Head* and *rostrum* as in *C. albipectus* (frons sometimes quite flat). *Antennae* with lengths of funicle segments 1–3 in ratio 3·2 : 1·5 : 1 (mean of four). *Prothorax* transverse (10 : 16·5–17·3), broadest behind middle; sides weakly to moderately rounded, converging anteriorly, with moderate anterior constriction; transverse striae usually deeply impressed and complete; disc of dorsal surface asquamose, with scattered punctures containing small setae, obscurely granulate or microrugose in mid-line and along hind margin, elsewhere uneven but smooth and shiny; sides with ill-defined granules and large whitish scales, sometimes dense; tract of imbricate white scales above coxa as in *C. albipectus* but less compact. *Scutellum* as in *C. albipectus*. *Elytra* globose-acuminate (10 : 7·4–8);



Figs. 49–54. *Catasarcus* spp. Aedeagus in dorsal and lateral view. 49, *C. memnonius* Pascoe. 50, *C. albisparsus* Pascoe (holotype). 51, *C. marginispinis* Pascoe (holotype). 52, *C. spinipennis* Fåhraeus. 53, *C. echidna* Pascoe (dorsal view only). 54, *C. concretus* Pascoe.

humeral tubercle and surface sculpture as in *C. albipectus*; post-humeral spine normal in both sexes (about as large as in *C. spinipennis*, etc.); dorsal spines all more or less tapering to a point, more elongate in male (× 1–1·4 and × 1·7–2·2 as long as broad) than in female (× 0·7 and × 1·1 as long as broad); anterior spines in female strongly divergent and close to posterior spines, as in female of *C. marginispinis*; both sexes have small bright and very small dull scales scattered throughout, with much larger pearly white scales forming a broad lanceolate patch covering base of post-humeral spine (above and behind) and extending posteriorly to level of hind coxa; similar scales on interstria 3 extend on to base of anterior dorsal spine (as in *C. marginispinis*); patches of similar but smaller scales occur around scutellum and on declivity below dorsal spines. *Legs* as in *C. albipectus* but claw-segment of tarsi slightly longer (= 2 + 3 in female, × 0·75 as long in male). *Underside* similar to that of *C. albipectus*. *Aedeagus* stouter and more strongly curved than in *C. albipectus*; deeply sulcate dorsally; convex below; either smooth throughout or apical region microgranulate and with a few coarse wrinkles below phallotreme; sides microrugose; upper surface microreticulate, especially towards base.

Holotype ♂. WESTERN AUSTRALIA: Lynton, 17.ix.1958 (*F. H. Uther Baker*), in the Western Australian Museum, Perth.

Paratypes. 1 ♀. same data as holotype (FHUB); 1 ♂, Northampton, 17.ix.1958 (*F. H. Uther Baker*) (BM(NH)); 1 ♂, Ajana, ix.1956 (*A. Douglas*) (W).

Very closely related to the preceding species.

## ***Catasarcus echidna*** Pascoe

(Text-figs. 16, 53, Map 4)

*Catasarcus echidna* Pascoe, 1870 : 16, 28.
*Catasarcus bellicosus* Pascoe, 1870 : 16, 28, **syn. n.**
*Catasarcus araneus* Pascoe, 1870 : 16, 29, **syn. n.**
*Catasarcus humerosus* Pascoe, 1870 : 17, 30, **syn. n.**
*Catasarcus funereus* Pascoe, 1870 : 17, 31, **syn. n.**
*Catasarcus brevicollis* Pascoe, 1870 : 17, 32, **syn. n.**
*Catasarcus scordalus* Pascoe, 1870 : 17, 37, **syn. n.**
*Catasarcus bellicosus* Pascoe; Lea, 1897 : 596.
*Catasarcus echidna* Pascoe; Lea, 1897 : 596.
*Catasarcus araneus* Pascoe; Lea, 1897 : 597.
*Catasarcus humerosus* Pascoe; Lea, 1897 : 597.
*Catasarcus funereus* Pascoe; Lea, 1897 : 597.
*Catasarcus brevicollis* Pascoe; Lea, 1897 : 597.
*Catasarcus scordalis* [*sic*] Pascoe; Lea, 1897 : 599.

Length 6·9–11·3 mm. Body, including elytral spines black; legs and antennae dark red (dorsal elytral spines sometimes red but then darker than legs). Scales dense, fairly uniform, unicolorous pearly or greenish white tinted with yellow-brown powdery exudate. *Head* and *rostrum* as in *C. spinipennis* but lateral frontal carinae more distinct, usually forming a sharp strongly curved edge to frons; median rostral carina sometimes tectiform and often raised, especially posteriorly. *Antennae* with lengths of funicle segments 1–3 in ratio 2·8 : 1·4 : 1 (mean of eight); scales mostly bronzy, dense. *Prothorax* of unusually variable proportions (10 : 16·7–19·5), the variation not related to sex; broadest about middle; sides weakly rounded, subparallel or weakly converging anteriorly; dorsal surface sometimes as in *C. spinipennis* but often more strongly granulate and transverse striae more deeply impressed. *Scutellum* as in *C. spinipennis*. *Elytra* ovate-acuminate (10 : 6·8–7·5); humeral tubercle variable, sometimes large sharp and directed obliquely anteriad, sometimes obsolete; post-humeral spine as in *C. spinipennis*; striae seldom clearly impressed; strial punctures large; disc with irregular transverse folds; shoulders with round granules, strongly raised and sharp in some females, obsolete in some males; base of interstria 3 almost always with either a large, usually sharp, strongly raised granule or a lower, smoothly rounded, shiny callus which may encroach upon adjacent interstriae; much smaller granule at base of interstria 5 and sometimes 2; anterior dorsal spines of male plainly nearer base of elytra than in other species (see above, p. 423 and Text-fig. 16); posterior spines larger in male than in female (× < 2·5 as long as broad); both spines weakly recurved posteriad in both sexes; interstria 3 sometimes raised as in some *C. spinipennis*. *Legs* similar to those of *C. nephelodes* (including vestiture).

*Vestiture* composed of large, pale and very small, colourless scales (intermediate-size bronzy scales sometimes present, especially on declivity). Large scales cover frons (except in mid-line) extending posteriorly to well beyond level of hind margins of eyes, dorsal area of rostrum (at least to level of insertion of antennae), underside of rostrum and head (dense below eye); on prothorax they occur mainly at sides, in anterior constriction (which is often deep) and along mid-line; density on elytra varies but they are usually very dense or imbricate around scutellum, behind dorsal spines and below post-humeral spine. Elytral spines bare or with very small dull scales only. Underside generally densely squamose but large discal areas of ventrites 1–4 bare or with scattered very small colourless scales; ventrite 5 with large scales confined to base and sometimes only at sides. Setae white or hyaline but becoming brown towards apex of elytra.

*Aedeagus* (Text-fig. 53) flat or weakly sulcate dorsally, moderately to strongly convex and smooth ventrally; apex narrow, elongate, parallel-sided, tip deflexed. *Ovipositor* with valves distinctly depressed but less strongly so than in *C. nephelodes*.

The following specimens are in BM(NH):

Holotype of *echidna*, ♂, with ' Champion B.' and 'Catasarcus/echidna/*type* Pasc.' Unique. A further male specimen from Pascoe's main collection, determined by him, has black dorsal spines, not red as in the holotype.

Holotype of *bellicosus*, ♂, with ' West/Australia ' and ' Catasarcus/bellicosus/*type* Pasc.' Not unique (' I have several specimens ') but I have been unable to recognize any paratypes with certainty. There is a male specimen, without locality, in Pascoe's supplementary collection determined by him as this species. There is also a small abraded male of *C. spinipennis* from the Fry collection with ' TYPE '; ' De Boulay '; ' Nov. Holl./Swan R.' and ' bellicosus Pasc.', the last in Pascoe's hand.

Holotype of *araneus*, ♂, with ' Champion B.' and ' araneus '. Paratype ♂, with ' TYPE '; ' 38239 '; ' Nov. Holl./Champion B.'; ' Fry Coll./1905.100 ' and ' Catasarcus/aranius [*sic*]/Pasc./Champion B.', the last in Pascoe's hand. (This is one of eight specimens of Coleoptera, Nos. 38237–38244, acquired by Fry from Pascoe very early in 1870 (previous page of register is dated 21.i.1870) and almost certainly before the publication of Pascoe's paper (March). These are the only specimens of Pascoe's species outside his own collection which have a definite claim to type-status).

LECTOTYPE of *humerosus*, ♀, with ' West Australia ' and ' humerosus ', the latter in Marshall's hand.

Paralectotypes: 2 ♀, with ' Champ. Bay ' (white rectangular label), one also with ' humerosus ' in Marshall's hand. There can be little doubt that the lectotype is one of the (several) specimens upon which Pascoe's description was based. The status of the paralectotypes is less clear; the locality is not mentioned by Pascoe but they fit the description and Marshall's label suggests that they were in Pascoe's series of this species. There is a female from Pascoe's supplementary collection with ' Catasarcus/humerosus/Pasc./Champ. B.' in his hand and another from the Fry collection with ' 37860 '; ' De Boulay '; ' Nov. Holl./Swan R.' and ' humerosus/Pasc.', the last in Pascoe's hand.

Holotype of *funereus*, ♀, with ' Champion B.' and ' Catasarcus/funereus/*type* Pasc.' Paratype ♀, with ' TYPE '; ' 38238 '; ' Nov. Holl./Champion B.'; ' Fry Coll./ 1905.100 ' and ' C. funereus/Pasc./Champion Bay ', the last in Pascoe's hand (see note under *araneus* above). There is also a female from Pascoe's main collection with ' funebris/Pasc.' in Marshall's hand.

Holotype of *brevicollis*, ♀, with ' Champion B.' and ' brevicollis '. Apparently unique.

Holotype of *scordalus*, ♀, with ' Champion B.' and ' Catasarcus/scordalus/*type* Pasc.' Apparently unique. There is a similar female from Pascoe's main collection, without locality, with ' scordalus/? ' in Marshall's hand. The incorrect spelling used by Lea occurs also in Masters' catalogue (1871).

A total of 89 specimens has been seen.

Localities: Geraldton; Dongara; Eradu; Morawa. A number of specimens of this (and other) species, especially in the Fry collection, bear the locality name ' Swan River '. This is believed to be an error. The collector is given as ' De Boulay ' (= F. H. du Boulay) who collected mainly around Geraldton (Musgrave 1932 : 72). Records for Newcastle, N.S.W. (Frey) and Queensland (BM(NH), V) are obviously false.

From his key, it is clear that Pascoe regarded the sexes of this species as distinct species-groups, the male comprising three species, the female four. Of the males, it is true that in *C. araneus* the lateral frontal carinae are reduced, as in typical *C. spinipennis* but this is characteristic of most small specimens of this species. Pascoe distinguishes *C. echidna* from *C. bellicosus* on the width of the head and rostrum but measurement shows that this difference is largely illusory; the lack of scales noted in *C. bellicosus* is merely the result of abrasion. It is worth noting, however, that the holotype of *C. echidna* is somewhat teneral and the dorsal elytral spines are dark red, whereas in *C. bellicosus* they are black. Of the females, the description of *C. scordalus* is based on a specimen in which the tips of the post-humeral spines have been broken off, reducing each to ' a mere tubercle ', while a prominent median frontal elevation accounts for the ' five short but very distinct carinae ' on the head; the dorsal elytral spines are, however, unusually slender, resembling those of the male (but in the female location). The types of *C. funereus* are simply abraded and nothing more need be said about them except that the specimen which Pascoe retained and labelled as the holotype is strongly bleached dorsally and thus fits the description less well than the specimen he passed to Fry, which is not at all bleached. The prothorax of *C. brevicollis* is not, in fact, ' more than twice as broad as long ' but only × 1·93 as broad; it is made to appear broader by a transverse tract of whitish scales which extends from one side to the other. The proportions of the prothorax in this species are, however, unusually variable. The specimens of *C. humerosus* are all normal; the lectotype is severely abraded.

As stated below (p. 435), Lea's observations were based solely on Pascoe's descriptions and do not merit detailed consideration.

Males of this species are easily distinguished from those of *C. spinipennis* and *C. nephelodes* by the position of the anterior dorsal spines (see above, p. 423) and the callus at the base of interstria 3. Females can usually be separated from *C. spinipennis* by the anterior spine index and from *C. nephelodes* by the callus (and other granules) on the elytra. It should also be noted that the dorsal elytral spines are usually quite black in this species but only rarely so in the others.

## *Catasarcus nephelodes* sp. n.

(Map 4)

*Catasarcus spinipennis* Fåhraeus; Pascoe, 1870 : 17, 32.

Length 7·7–11 mm. Body, including post-humeral spines, black; legs, antennae and dorsal spines red or dark red. Elytra commonly with a series of pale patches on a dark background; pale scales usually with strong coppery or rosy reflection; powdery exudate seldom present. *Head* and *rostrum* as in *C. spinipennis* (vestiture excepted) but epistome often flat and chin more pronounced. *Antennae* with lengths of funicle segments 1–3 in ratio 3 : 1·6 : 1 (mean of five); scape and funicle covered with large ovate or oblong scales, mostly pearly or otherwise metallic but those on basal two-thirds of scape usually bronzy. *Prothorax* with ratio of dimensions 10 : 16·7–17·8, broadest at or near base; sides moderately rounded; dorsal surface fairly smooth; both transverse striae well developed and complete or nearly so; distinct granules at sides but often obscured by scales. *Scutellum* very small with punctures and filiform scales. *Elytra* ovate-acuminate (10 : 7–7·5); costa strongly sinuous, as in *C. spinipennis*; apex weakly mucronate; humeral tubercle small and sharp or obsolete; post-humeral spine as in *C. spinipennis*; anterior dorsal spine sometimes no longer than (at extreme base) broad; posterior spine up to twice as long as broad, or more; when long, usually somewhat reflexed posteriad; striae scarcely impressed on disc; interspaces weakly convex, with some tendency to form weak transverse folds (especially in female) but without any granules. *Legs* as in *C. spinipennis* (vestiture excepted). *Venter* almost smooth in female; ventrites 1 and 2 in male with scattered granules which are denser and bead-like at sides of ventrite 1.

*Vestiture* dorsally composed typically of small dark bronzy or reddish bronze scales with a series of patches of much larger, paler scales which are usually pearly but often tinged with golden yellow by traces of powdery exudate, especially on head. Large scales occupy base of dorsal area of rostrum, frons, including admedian carinae (especially large at level of hind margins of eyes), underside of head (imbricate below eye) and underside of rostrum; on prothorax they form a stripe of variable width near sides and a narrow median stripe, either of which may be ill-defined or obsolete; on elytra they always occupy base of interstria 1 and sometimes extend along it, sparsely, to declivity; small humeral patch present, also larger triangular patch on area in front of anterior spine between striae 3 and 4; size of this pre-spinal patch is related to size of area, which is sometimes very small and patch absent (especially in Hill River specimens); sometimes pre-spinal patch is linked to humeral patch by tract of scales along interstria 6; scales on declivity sometimes almost entirely of small dark type and very dense but more often with sprinkling of pale scales which are condensed in strial punctures and on an ill-defined area behind anterior spine; sides of elytra below and (for a short distance) behind post-humeral spine with very large imbricate scales (these and those on adjacent parts of thorax are sometimes white, contrasting strongly with dull upperside). Underside densely squamose. Setae on head and rostrum white; on prothorax white and brown; on elytra smaller, dark brown and very inconspicuous; on thoracic sterna and ventrites 1 and 2 white; on ventrites 3–5 brown. Femora typically with small round appressed separate scales, coppery or greenish, with a glowing blue or violet reflection; heads of femora with mostly similar but denser scales; dorsal surface of hind (sometimes all) femora often with larger, pink scales without reflection; scales on tibiae pale ventrally, bronzy dorsally; those on tarsi bronzy, often with strong green reflection and sometimes with pearly scales intermixed, especially on claw-segment; setae on shafts of femora long and white or hyaline; elsewhere blackish brown.

*Aedeagus* sulcate dorsally, weakly convex or flat in middle of length ventrally, becoming quite flat or somewhat concave below phallotreme; surface here with transverse wrinkles, variable in extent but always present; sides and sometimes entire dorsal surface, microreticulate or microrugose; apex about as in *C. spinipennis*. *Ovipositor* with valves strongly depressed apically, together distinctly broader than high.

Holotype ♂. WESTERN AUSTRALIA: Perth, Mount Yokine, 26.i.1957 (*I. M*[*urray*]), in the National Museum of Victoria, Melbourne.

Paratypes. 5 ♂, 2 ♀, same data as holotype (6 V, 1 BM(NH)); 1 ♂, ditto but 15.xii.1956; 1 ♀, ditto but 26.iii.1957 (both V); 3 ♂, 2 ♀, ditto but 27.i.1958 (4 V, 1 BM(NH)); 1 ♂, Perth, i.1961; 1 ♂, Bullsbrook, 29.xii.1947 (*A. D*[*ouglas*]) (both V); 6 ♂, 5 ♀, Hill River district, 8.xii.1962 (*F. H. Uther Baker*) (7 FHUB, 4 BM(NH)); 2 ♀, Swan River, [18]43–14 [' Presented by Dr. Richardson ']; 1 ♂, same locality, [18]43–28 [' Bought of Turner '] (all BM(NH)); 1 ♂, same locality (*Kirsch*) (Dresden); 1 ♀, same locality (*Hope*), incorrectly labelled as holotype (' Typus ') of *C. spinipennis* (Stockholm); 2 ♀, same locality (' SR ') (*Baly*), 1 ♂, same locality (' Sw. R '), 439, all ex Bowring coll. (all BM(NH)); 1 ♂, same locality, 37861, ex Fry coll.; 1 ♀, same locality, ex Pascoe coll. (both BM(NH)); 1 ♀, same locality (*J. S. Clark*) (V); 1 ♀, Champion Bay (printed label) and ' C. capito/var.?/Champ.' (in Pascoe's hand); 1 ♂, with ' C. nitidulus/var.?/Champ.' (in Pascoe's hand), both ex Pascoe coll. (BM(NH)); 1 ♂, ' New Holland ', [18]44–4 [' Collected by [B.] Bynoe Esq. Surgeon R.N.'] (BM(NH)); 1 ♀, with ' Austral ' and ' Erwerb 1955/Coll. Brancsik ' (Frey); 2 ♀, with ' Coll. Baden-/Sommer./ex V. d. Poll./Pres. 1911, E./B. Poulton ' (Oxford); 2 ♂, 1 ♀, Adelaide; 1 ♂, ' N. Holld.', 1 ♂, without data, all ex Hope coll. (all Oxford); 2 ♂, 1 ♀, without localities, ex Howitt coll.; 1 ♀, without data (all V); 1 ♂, ditto, ex Marshall coll.; 1 ♀, ditto, ex Sharp coll. (both BM(NH)). Total: 56 specimens. About 15 further specimens have been seen; these were returned to their owners determined as *C. spinipennis* before the mis-labelling of the holotype of that species was noted. Similarly, many specimens of *C. spinipennis* were returned determined as *C. ericius* (a synonym of *C. spinipennis*).

Localities: Mount Yokine (4 miles north of Perth); Bullsbrook; Hill River. The record for Adelaide is obviously false.

This species exhibits less variation in scale size than does *C. spinipennis*. The pre-spinal patches, to which (with others) the name refers, are not always present or distinct and are sometimes evident in related species; they are, nevertheless, most characteristic of this species.

## ***Catasarcus albuminosus*** Pascoe

*Catasarcus albuminosus* Pascoe, 1870 : 16, 29.
*Catasarcus albuminosus* Pascoe; Lea, 1897 : 597.

Pascoe's description was based upon a single, almost totally abraded and severely bleached specimen. He later associated with it a second specimen in similar condition which happens to be conspecific with the first. Externally, allowing for the lack of scales, these specimens, both male, agree closely with some *C. echidna* except that they lack any definite callus at base of interstria 3; their anterior spine indices (37 and 39) are possible for *C. echidna* and much too low for anything else. The aedeagus, however, is wrinkled below in both specimens, more extensively so than in *C. nephelodes*, the only closely related species having this character. It seems best, therefore, to maintain this species as valid but to await further material before attempting a formal description.

Holotype ♂, with 'Champion B.' and 'Catasarcus/albuminosus/*type* Pasc.' in BM(NH). Unique ('3¾ lines'). A larger specimen from Pascoe's main collection, without locality, is labelled 'albuminosus' in his hand.

A third male specimen, agreeing closely in structure and condition with the others and with spine index 39·6, is in the W. Tylden collection (Oxford).

## ***Catasarcus spinipennis*** Fåhraeus

(Text-figs. 1, 17, 52, Map 4)

*Catasarcus spinipennis* Fåhraeus in Schönherr, 1840 : 817.
*Catasarcus spinipennis* Schönherr; Labram and Imhoff, 1848, No. 27; fig.
*Catasarcus spiniferus* Lacordaire, 1863 : 249 [? error for *spinipennis*].
*Catasarcus nitidulus* Pascoe, 1870 : 17, 30, **syn. n.**
*Catasarcus ericius* Pascoe, 1870 : 17, 37, **syn. n.**
*Catasarcus spinipennis* Fåhraeus; Lea, 1897 : 591, 595.
*Catasarcus nitidulus* Pascoe; Lea, 1897 : 596.
*Catasarcus ericius* Pascoe; Lea, 1897 : 599.
*Catasarcus spinipennis* Fåhraeus; Lea, 1909*b* : 216.
*Catasarcus spinipennis* Fåhraeus; Tillyard, 1926 : 242; pl. 19, fig. 18.

Length 7·1–12·4 mm. Body, including post-humeral spines, black; antennae, legs and dorsal elytral spines red, dark red, or almost black. Scales mainly pinkish white; scanty yellow-brown powdery exudate present. *Head* with frons broad (almost double long axis of eye), flat and smooth; frontal carinae short, sometimes obscured by scales, both pairs strongly converging anteriorly; axis of lateral carina in line with centre of eye; smooth slender tectiform carinula present in mid-line, usually extending from near transverse furrow to level of centre of eyes (but often obsolete); eyes moderately convex and about × 1·3 as long as broad. *Rostrum* × 1·2–1·4 (♂), × 1–1·3 (♀) as long as broad, progressively widening apically; epistome triangular, disc broadly depressed; median carina narrow, sharp, level, weakly projecting over the deep transverse furrow; oblique basal sulci (with concomitant carinae anteriorly) distinct. *Antennae* with lengths of funicle segments 1–3 in ratio 2·8 : 1·5 : 1 (mean of ten); remaining segments longer than broad; club fusiform. *Prothorax* transverse (10 : 17–18·9), broadest about middle; sides weakly to moderately rounded; post-ocular lobes small, angular, with relatively long white vibrissae; transverse striae complete or nearly so, usually strongly impressed; mid-line from anterior transverse stria to base with more or less irregular linear impression; disc smooth, uneven or obscurely granulate; sides distinctly to strongly granulate. *Scutellum* small, densely punctured, with elongate and filiform scales. *Elytra* ovate-acuminate (10 : 6·7–7·5); humeral tubercle varying from large to obsolete; post-humeral spine usually large, narrow and sharp, with axes of spines on each elytron coincident but tip often strongly reflexed posteriad (possibly a mechanical effect while in teneral state); spine sometimes much smaller, resembling sharp tubercle of some non-spiny species; each elytron (Text-figs. 1, 17) with a large elongate strongly tapering pointed spine in interstria 2 at top of declivity and a similar but shorter spine in interstria 3, anterior to first; bases of spines separated only by punctures of stria 2; axes of spines about at right angles to bases (seen from behind), hence divergent; spines larger, on average, in male than in female; anterior spines sometimes very small and shorter than broad at extreme base (very rarely obsolete); posterior spines larger, rapidly and evenly tapering when $< \times 1{\cdot}4$ as long as broad but subcylindrical and more strongly curving posteriad when longer ($< \times 2{\cdot}2$ as long as broad), the curvature often apparently accentuated mechanically in teneral state; elytral interspaces sometimes fairly uniformly raised, forming a smooth reticulum with weak transverse folds but usually with strong transverse folds over disc and numerous raised granules in shoulder region (granules sharp in some large females); interstria 3 from base to anterior dorsal spine often slightly higher than 2 and 4 (elevation revealed by selective abrasion) and often with large granule at base, as in *C. echidna* but here with series of similar granules throughout basal portion. *Legs* with femora moderately swollen; tibial teeth small; corbels large, with about 5–15 adventitious setae; segments 2 + 3 of hind tarsus about as long as claw-segment in ♀, longer in ♂. *Venter* without post-coxal cavities; ventrites 1 and 2 with shiny bead-like granules, numerous and prominent in male, scattered and inconspicuous in female.

*Vestiture* exceedingly variable. In one extreme form, from Carnac Island, all scales are very large, round, loose, whitish, with weak coppery reflection (stronger on legs), somewhat condensed along suture, before and, more especially, behind dorsal spines, covering latter partially and post-humeral spines almost entirely (cf. *C. nephelodes*); at most a few bronzy scales on disc of pronotum, near apex of elytra, on dorsal edge of hind tibiae and sprinkled on tarsi. A very similar form from Rottnest Island has small appressed coppery or metallic green scales on heads of femora. Specimens from Garden Island and various mainland localities show a progressive reduction in size of scales on femora, parts of elytra and prothorax. The most extreme examples, mainly from the Fremantle area, resemble *C. nephelodes* except that their scales are all pearly, coppery or greenish white (including those on tarsi). Setae on tarsi blackish brown; elsewhere on body and legs white or hyaline (long and rather conspicuous on femora).

*Aedeagus* (Text-fig. 52) flat dorsally (surface often uneven), weakly to very strongly concave ventrally; never with any transverse wrinkles below phallotreme; apical region short, tip sharp, not swollen, weakly deflexed. *Ovipositor* with valves compressed but no higher than together broad.

Holotype of *spinipennis*, ♂, with '*Polydius? spi/nipennis* Hop/Swan Rivier/ N. Holl. Hope' and 'Paratypus' in Naturhistoriska Riksmuseum, Stockholm. Unique.

From the determination label and the fact that it agrees closely with the description, I am convinced that this is the specimen which Fåhraeus described, not that of *C. nephelodes* which has been incorrectly labelled as the holotype.

The following specimens are in BM(NH):

Holotype of *nitidulus*, ♀, with 'Swan River' and 'Catasarcus/nitidulus/*type* Pasc.' Unique.

Holotype of *ericius*, ♂, with 'Swan Riv.' and 'Catasarcus/ericius/*type* Pasc.' Unique.

Some 300 specimens seen.

Localities: Perth area; Moore River; Bejoording; Darlington; Lake Jandakot; Carnac Island; Rottnest Island; Garden Island; Naval Base; Medina; Kwinana; Cape Peron; Safety Bay; Jarrahdale; Peel Estate; Buckland Hill (near Collie); Bunbury; Busselton; Cape Naturaliste; Quindalup; Yallingup; Pemberton. Two specimens in F.E. Wilson's collection labelled ' Wialki W. A./Sep. 51/Dr. Uther Baker ' are thought to be wrongly labelled; Dr. Baker informs me that he has no specimens from this locality in his own collection. False records have been seen for Kiata, V. (V); Mount Canabolas, N.S.W. (A); Melbourne (Dresden) and Brazil (BM(NH)).

Pascoe, having misidentified an undescribed species as *C. spinipennis*, described the two sexes of the latter as new. The scutellum of the holotype of *C. nitidulus* appears to be ' larger than usual ' because the prothorax has moved forward, exposing the entire scutellar area of the mesonotum, from which the scutellum proper is not clearly differentiated.

As stated earlier (p. 423), Lea was grievously mistaken in thinking that all the seventeen quadrispinate species described by Pascoe were synonyms of *C. spinipennis*. He based this view upon his inability to distinguish more than one species in the field and upon a study of the descriptions; he did not see the types.

This species exhibits wide variation in the proportion of large pale scales present. Specimens from the off-shore islands have most large scales but those from some mainland localities are very similar.

## ***Catasarcus concretus*** Pascoe

(Text-figs. 18, 54, Map 4)

*Catasarcus concretus* Pascoe, 1870 : 17, 38.

Length 7·2–9·6 mm. Body, including elytral spines, black; legs and antennae dark red. Scales fairly dense, mainly pearly, not forming a definite pattern. *Head* as in *C. marginispinis* but eyes smaller, more strongly convex and less elongate (× 1·3 as long as broad). *Rostrum* as in *C. marginispinis* but genae less strongly widening apically (on average), hence only × 1·2–1·3 as long as broad. *Antennae* with lengths of funicle segments 1–3 in ratio 2·6 : 1·4 : 1 (mean of four); densely squamose throughout. *Prothorax* as in *C. marginispinis* but sides more strongly rounded and broadest in basal half; post-ocular lobes obsolete (vibrissae normal); basal marginal stria distinct and complete; dorsal surface with disc uneven and with large irregular granules at sides. *Scutellum* exactly as in *C. marginispinis*. *Elytra* as in *C. marginispinis* but with accessory anterior spine present in interstria 4, directly in front of anterior dorsal spine, × 0·7 (♂) (Text-fig. 18), × 0·6 (♀) as long as broad, strongly reflexed posteriad in female; posterior spines sited higher on declivity than in all other species, so that axes of all four major spines lie in same plane; disc more strongly tuberculate than in *C. marginispinis* and sometimes with one or two tubercles on declivity on interstriae 3 and 5. *Legs* as in *C. marginispinis* but tarsi larger and broader (especially segment 2).

*Vestiture* variable; mainly whitish, variegated or sprinkled with dark or coppery scales (including area below eye); prothorax as in *C. marginispinis* but pattern broken up at sides by bare interstices between granules; femora with mostly pearly or coppery scales, tibiae and tarsi mostly bronzy; venter variegated; setae brown throughout.

*Aedeagus* (Text-fig. 54) depressed in mid-line above, broadly concave below, scarcely widening at phallotreme; sides and dorsal surface (except in mid-line) transversely microrugose; area below phallotreme flat and confusedly microrugose; apex elongate and very narrow, very weakly spatulate, almost straight in profile view. *Ovipositor* with valves compressed but slender apically, together somewhat broader than high.

Holotype ♀, with ' Queensland ' and ' Catasarcus/concretus/*type* Pasc.' in BM(NH). Unique.

Localities: Hopetoun. The published type-locality is clearly false and a small abraded male from the Masters collection (Macleay) with ' Swan R.' must be wrongly labelled. This species was taken at Hopetoun by Dr. F. H. Uther Baker on 13.x.1950 (1 ♀) and 20.ix.1965 (3 ♂). The only other specimen known to me is an abraded female from the Bovie collection (Washington) labelled ' Australie Lea '.

Seven specimens seen.

The only species with six dorsal elytral spines. Apart from the third pair of spines and the more strongly convex eyes, this species closely resembles the more uniformly coloured forms of the following species. It is astonishing, therefore, to find that in *C. concretus* the valves of the ovipositor, although strongly tapered in profile view, are apposed and subcylindrical, whereas in *C. marginispinis* they are strongly explanate, flattened and blade-like.

Pascoe's tentative suggestion (p. 38) that specimens with six dorsal elytral spines may be the females of species in which the male has an additional, pre-basal, pair of spines is certainly mistaken. Although his specimen of *C. concretus* is, as it happens, female, the male also has only six spines. In both sexes, however, there is a single or double, rounded or sharp tubercle near the base of interstria 5, where the pre-basal spine occurs in *C. lepidus*. Both sexes of the latter have eight spines. (*C. lepidus* was the only octospinate species known to Pascoe; his last four descriptions all apply to this species). I have been unable to recognize the Fry specimen to which Pascoe refers (p. 38, note) as ' evidently belonging to one of the species in this section [but] which is without the basal spines '. There is a Fry specimen of *C. carbo* which may be the specimen in question; these species are very similar in appearance and Pascoe could have failed to notice that this specimen has only four post-median spines.

### ***Catasarcus marginispinis*** Pascoe

(Text-figs. 51, 56, 57, Map 4)

*Catasarcus marginispinis* Pascoe, 1870 : 17, 32.
*Catasarcus marginispinis* Pascoe; Lea, 1897 : 597.

Length 6·5–10·3 mm. Body, including elytral spines, black; legs and antennae dark to blackish red. Scales forming a fairly constant pattern of pale markings on a darker ground, ranging from brilliant white on black to pale grey on golden brown or dark grey; brown powdery exudate sometimes present. *Head* with lateral frontal carinae entirely absent, frons falling away steeply and evenly from the greatly reduced admedian carinae; median frontal sulcus usually short but sometimes extends shallowly (rarely deeply) between eyes; centre and sides of frons either smooth or with longitudinal striations; eyes weakly convex, × 1·5 as long as broad. *Rostrum* × 1·1 as long as broad, genae strongly widening apically; epistome well defined, disc depressed, with two adherent flanking setae on each side; median carina moderately to strongly

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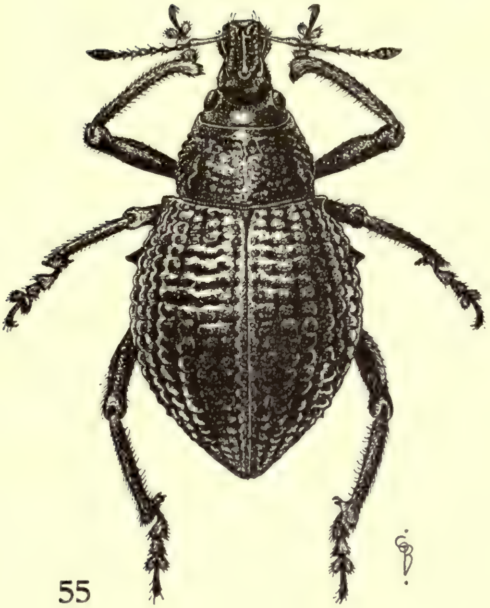
FIGS. 55–58. 55, *Catasarcus memnonius* Pascoe ♂. 56, *C. marginispinis* Pascoe ♀ (Wattening). 57, *Idem* ♂ (Tammin). 58, *C. albisparsus* Pascoe ♀.



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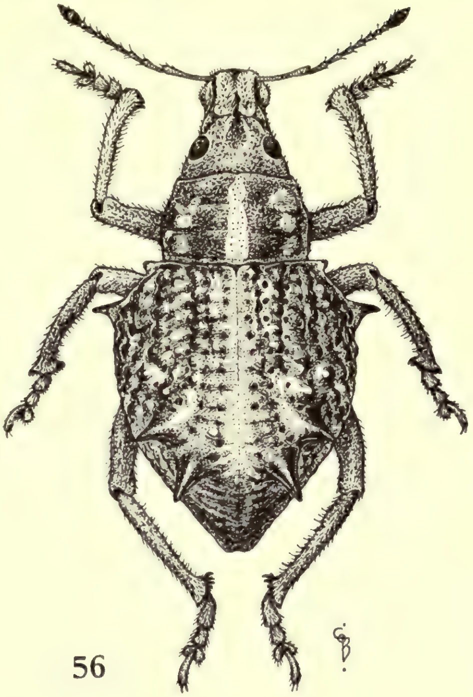

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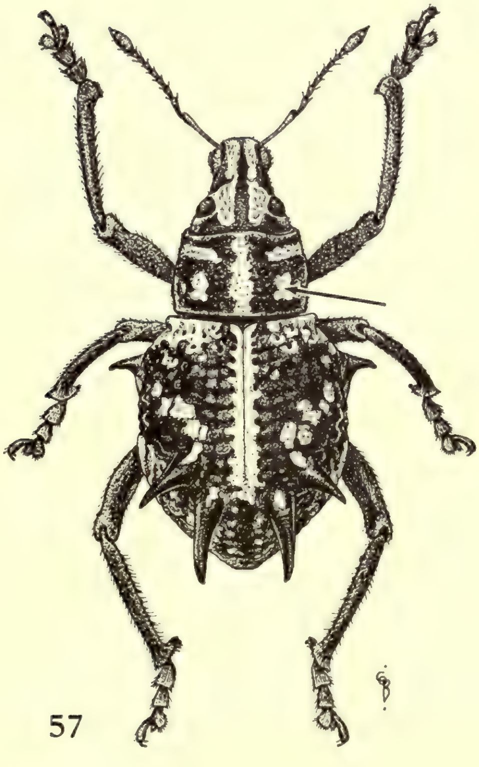

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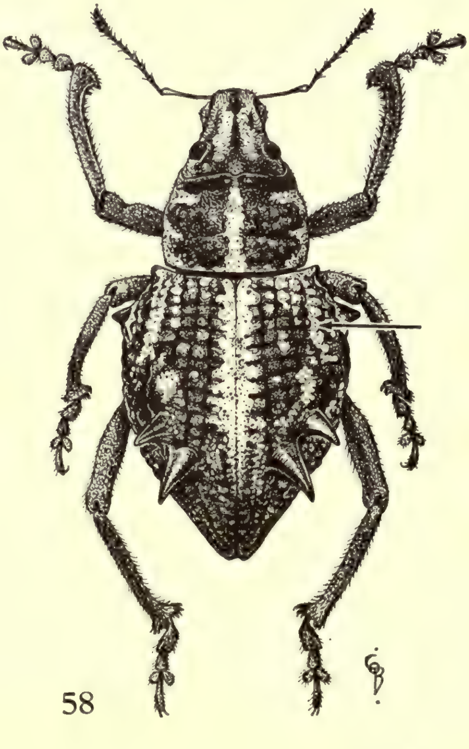

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raised at base, distinctly higher than frons and usually more or less parallel with latter in profile view. *Antennae* with lengths of funicle segments 1–3 in ratio 2·5 : 1·4 : 1 (mean of eleven). *Prothorax* of variable proportions (10 : 15·6–19), sides weakly to moderately rounded, often subparallel in basal half, distinctly converging anteriorly; post-ocular lobes evenly rounded, vibrissae subequal; posterior transverse stria strongly impressed (except in mid-line), anterior less so, often irregular and confused with strong anterior constriction; dorsal surface obscurely to distinctly granulate, more strongly so at sides. *Scutellum* scarcely developed; scutellar area of mesonotum with a number of vividly metallic iridescent scales. *Elytra* globose-acuminate (10 : 7·2–8); humeral tubercle basal or pre-basal, large and sharp or small or obsolete; a small round shiny forwardly-directed tubercle present at base of interstria 2 (nearly always), and 3 (usually), with sometimes a smaller scale-covered tubercle at base of interstria 5 (development of these tubercles sometimes differs on elytra of same specimen); post-humeral spine as large as in *C. spinipennis* or larger, axis often inclined anteriad but tip deflexed posteriad; dorsal spines about as broad at base as in *C. spinipennis* but less elongate: anterior × 1, posterior × 1·3 as long as broad in male, × 0·6 and × 1 as long in female; disc (except interstria 1) usually with undulating transverse folds and sometimes with raised granules (especially on interstria 5) but sometimes without either; often with an isolated granule on pre-spinal area (interstria 4) which corresponds to accessory anterior spine in *C. concretus*. *Legs* as in *C. spinipennis* but with dark setae throughout and corbels very narrow, with only 1–3 distinct adventitious setae.

*Vestiture* of two main types. In Tammin and Lake Grace specimens, male has sharply defined pattern in white on black (apparently bare) background (Text-fig. 57). White scales large and imbricate, brilliant white with pearly lustre; background scales smaller, bronzy and dense on head, prothorax and elytral declivity; on disc of elytra very small, thin, closely appressed, separate and dark but iridescent. Females from same localities have pattern similar but less sharpely defined and background scales all of intermediate size, bronzy with green reflection, more or less obscuring the cuticle. In second type (from Wattening–Bejoording area) (Text-fig. 56) white elytral markings are reduced and large areas, including sutural stripe (interstria 1) and interstriae 4 and 6 (on disc) are occupied by rather small bright golden scales; also median and post-ocular tracts on prothorax and frontal region of head are sometimes partly or wholly golden. The holotype (locality uncertain) has no golden scales; all large scales are pale bluish grey, some with weak coppery reflection. (Some Wattening–Bejoording specimens with few golden scales approach pattern of holotype). Scales on legs and antennae imbricate, usually bronzy (often with green reflection), with sprinkling of greenish or bluish white scales (which sometimes predominate, especially on shafts of femora); setae dark, hair-like. Scales on venter dense, usually pale throughout but in males from Tammin and Lake Grace they are uniformly white at sides of each ventrite and on anterior part of 1 and 2; elsewhere uniformly dark; setae small and dark.

*Aedeagus* (Text-fig. 51) depressed in mid-line above, strongly and evenly convex below; apex moderately produced, tip broadly rounded, not deflexed; sides sometimes with irregular wrinkles. *Ovipositor* with valves apically explanate, flattened and blade-like.

Holotype ♂, with ' Champion B.' and ' Catasarcus/marginispinis/*type* Pasc.' in BM(NH). Unique (' My specimen ').

A total of 26 specimens seen (14 W, 6 S, 5 BM(NH), 1 A).

Localities: Wattening; Bejoording; Tammin; Lake Grace. The published type-locality is probably inaccurate, if not actually false.

Colour patterns in this species require further study. It seems remarkable that specimens from Tammin should be identical with those from Lake Grace (100 miles SSW) but strikingly different from those from Wattening and Bejoording (about 60 miles WNW).

It might be thought that Pascoe's name refers to the sharp tubercles on the basal margin of the elytra but in fact he was impressed by the way the tapering tracts of pale scales ascend the basal portion of the dorsal spines: 'The disposition of the scales on the spines gives the latter the appearance, when viewed under an ordinary lens, of being margined (with black)'.

### ***Catasarcus albisparsus*** Pascoe

(Text-figs. 50, 58)

*Catasarcus albisparsus* Pascoe, 1870 : 16, 35.
*Catasarcus capito* Pascoe, 1870 : 17, 33, **syn. n.**
*Catasarcus capito* Pascoe; Lea, 1897 : 597.
*Catasarcus albisparsus* Pascoe; Lea, 1897 : 598.

Length 7·6–10·2 mm. Body, including post-humeral spines, black; antennae, legs and dorsal elytral spines dark red. Scales forming a pattern of white lines and patches on a black background (Text-fig. 58). *Head* as in *C. cicatricosus* but eye only × 1·3 as long as broad; scales brown on vertex and middle of frons, elsewhere white. *Rostrum* as in *C. cicatricosus* but median carina more or less in line with frons in profile view, not strongly raised or arched; scales brown on carina, elsewhere white. *Antennae* with lengths of funicle segments 1–3 in ratio 3 : 1·5 : 1 (mean of five); scales small, dense and mostly dull. *Prothorax* subcylindrical, weakly transverse (10 : 13·4–15·6), a little wider at base than at apex (especially in female); sides weakly to moderately rounded, broadest about middle; post-ocular lobes angular, vibrissae longest at the angle (cf. *C. marginispinis*); dorsal surface obscurely granulate (sometimes with well defined granules at sides); both transverse striae very strongly impressed; weak linear impression in mid-line; white scales imbricate and forming a sharply defined pattern or less dense and pattern ill-defined; remaining areas bare or with small inconspicuous brown scales. *Scutellum* with numerous ovate light or dark scales. *Elytra* globose-acuminate (10 : 7·2–7·9), less elongate, on average, in male than in female; humeral tubercle obsolete in male, moderate and acute in female; very small basal tubercle present on interstria 3 (always), 2 (often) and 5 (sometimes); post-humeral and dorsal spines as in *C. spinipennis* but latter in similar position in both sexes (see p. 424); disc with sinuous undulating transverse folds or a strongly raised reticulum (sometimes interspersed with raised granules); scale-pattern (Text-fig. 58) includes imbricate white scales on interstria 1 (to level of posterior dorsal spines), 3 (almost to level of anterior dorsal spines), 9 and 10 (but not, or only partly, on post-humeral spine); similar scales form an oblique tract at sides below anterior spine; this tract breaks up posteriorly and, like the sutural stripe, merges with the smaller duller scales of the declivity; remaining areas, which appear bare, are in fact occupied by fairly dense, very small appressed brown or bronzy scales (as in some *C. marginispinis*); dorsal spines and declivity distinctly setose. *Legs* as in *C. nephelodes* but scales mostly pale throughout and denser on femora; corbels with 2–10 adventitious setae. *Venter* and *thoracic sterna* densely squamose throughout; scales large, great majority white or pearly. *Aedeagus* (Text-fig. 50) narrowest in middle of length, flat or weakly concave dorsally, convex and smooth ventrally; apex short, tip blunt, weakly swollen, not deflexed. *Ovipositor* as in *C. marginispinis*.

The following specimens are in BM(NH):

Holotype of *albisparsus*, ♂, with 'Champion B.' and 'Catasarcus/albosparsus [*sic*]/*type* Pasc.' Apparently unique. A slightly larger specimen, from the Fry collection, has '37857'; 'TYPE'; 'De Boulay'; 'Nov. Holl'/Swan R.' and 'albosparsus/Pasc.', the last in Pascoe's hand.

Holotype of *capito*, ♀, with 'Champion B.' and 'Catasarcus/capito/*type* Pasc.' Almost certainly unique but another specimen from Pascoe's main collection bears a label 'capito' in his hand.

Six specimens seen (all BM(NH)).

Localities: None certain; probably occurs in the Geraldton area.

The ' sand-like exudation ' mentioned by Pascoe in the description of *C. capito* is discussed on p. 365 above.

This species bears a superficial resemblance to the black and white form of *C. marginispinis* but is at once distinguished from the latter by its red dorsal elytral spines.

## ***Catasarcus cicatricosus*** Pascoe

(Text-fig. 60)

*Catasarcus cicatricosus* Pascoe, 1870 : 17, 36.
*Catasarcus ochraceus* Pascoe, 1870 : 17, 34, **syn. n.**
*Catasarcus ochraceus* Pascoe; Lea, 1897 : 598.
*Catasarcus cicatricosus* Pascoe; Lea, 1897 : 599.

Length 8·3–10·8 mm. Body, including post-humeral spines, black; antennae, legs and dorsal elytral spines red to blackish red. Scales golden or brownish grey; elytra with well marked white flash at sides. *Head* as in *C. spinipennis* but lateral frontal carinae further reduced (sometimes obsolete); frons weakly convex and without a median cariniform elevation; eyes weakly convex, about × 1·5 as long as broad. *Rostrum* as in *C. spinipennis* but genae wider, hence only × 1·1 as long as broad, epistome shorter (hence transverse) and median carina raised at base. Head and rostrum densely squamose throughout; scales large, pearly or bluish white, imbricate and brilliant below and (narrowly) around eye; setae mostly white on rostrum and frons; both scales and setae brown on vertex. *Antennae* with lengths of funicle segments 1–3 in ratio 2·7 : 1·4 : 1 (mean of five); scales dense, mostly pale. *Prothorax* barrel-shaped, less strongly transverse than in *C. spinipennis* (10 : 13·7–16), base scarcely broader than apex; dorsal surface smooth, with at most a few low ill-defined granules; both transverse striae moderately to strongly impressed but interrupted in mid-line which is sometimes narrowly impressed; scales mostly whitish or golden along mid-line and at sides (sometimes forming well defined stripes) and filling anterior constriction, elsewhere mainly dark; setae brown. *Scutellum* undefined; scutellar area of mesonotum usually almost flat (adjoining parts of elytral base consequently depressed) and covered with small ovate pearly scales. *Elytra* somewhat as in *C. spinipennis* (ratio of dimensions 10 : 6·7–7·5) but often more strongly convex, post-humeral spine usually larger and more slender, humeral tubercle moderate to absent (sharp when present) and with a small sharp shiny forwardly-directed tubercle at base of interstriae 2, 3 and sometimes 5; disc with transverse folds weaker than in *C. spinipennis* but often with strongly raised granules on interstriae 5 and 7 between level of anterior side of post-humeral spine and same of anterior dorsal spine; scales dense, predominantly golden or golden yellow (rarely grey), small; larger pearly white imbricate scales form a broad tract at side, extending from dorsal side of post-humeral spine (interstria 9) obliquely across interstria 8 and along entire width of interstria 7 (which is here broader and more strongly convex than adjacent interstriae) to point where striae 6 and 7 meet; similar scales present on apical part of interstria 9 and sometimes along basal half of 3; dorsal granules (when large) and ventral part of post-humeral spine, bare; setae brown, those on dorsal spines conspicuous. *Legs* as in *C. nephelodes* but hind tibial teeth more regular, corbels with numerous adventitious setae (about twenty) and claw-segment × 1·1 as long as 2 + 3 in female, × 0·86 as long in male; setae brown throughout. *Venter* and *thoracic sterna* with dense, mostly very pale scales throughout; setae brownish. *Aedeagus* (Text-fig. 60) depressed, tapering continuously from base to apex; flat and weakly sclerotized dorsally, strongly convex and smooth ventrally; apex somewhat elongate, tip swollen, not at all deflexed. *Ovipositor* with valves explanate and shaped as in *C. albisparsus* but very thick, not blade-like.

The following specimens are in BM(NH):

Holotype of *cicatricosus*, ♂, with 'Champion B.' and 'Catasarcus/cicatricosus/*type* Pasc.' Unique. The other specimen mentioned by Pascoe (p. 37) is a small female with 'Champion B.' and 'cicatricosus/var.?' in Pascoe's hand.

Holotype of *ochraceus*, ♂, with 'Champion By' and 'ochraceus'. Apparently unique.

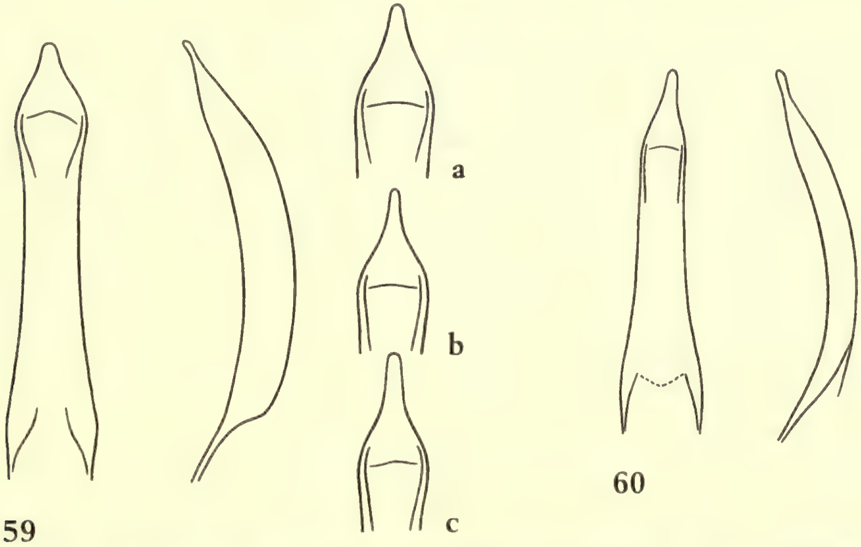
A total of 9 specimens seen (7 BM(NH), 1 V, 1 Manchester; the last lacks head and prothorax).

Localities: None certain; presumably occurs in the Geraldton area. Two specimens from the Fry collection are labelled 'De/Boulay'; 'Nov. Holl./Swan R.' but this locality is believed to be false (see above, p. 430).

### *Catasarcus murex* sp. n.

(Text-figs. 19, 20, 61, Map 4)

Length 7·7–12 mm. Head and body black; prothorax, antennae, legs, elytral spines and larger tubercles, dark red. Scales mainly brilliant pearly white, tending to form longitudinal stripes on prothorax and elytra; brown powdery exudate often present. *Head* with frons flat to distinctly convex; lateral frontal carinae reduced anteriorly, often obsolete or replaced by carinulae but sides of frons above eye often angulate or even carinate; admedian carinae short, converging anteriorly; median sulcus variable, smooth or finely striated, with no median elevation; eyes very weakly convex and × 1·5 as long as broad. *Rostrum* < × 1·3 as long as broad, strongly widening apically; epistome small, ill-defined, strongly pitted, with a few small white scales and setae posteriorly; median carina usually raised and projecting posteriorly over transverse furrow; chin well marked. *Antennae* with lengths of funicle segments 1–3 in ratio



Figs. 59, 60. *Catasarcus* spp. Aedeagus in dorsal and lateral view. 59, *C. carbo* Pascoe (holotype). 59*a–c*, *Idem*, apex showing variation (*c* is from Murchison River Reserve). 60, *C. cicatricosus* Pascoe (holotype).

2·5 : 1·45 : 1 (mean of five); scape and funicle densely squamose throughout, scales bronzy with a sprinkling of pale scales. *Prothorax* transverse (10 : 16–17·4 (♂), 17·4–19 (♀)), broadest between middle and base; sides weakly rounded, converging anteriorly; post-ocular lobes well developed, rounded; anterior constriction weak; dorsal surface uneven but smooth, with very small scattered punctures; transverse striae variable; some granules present near hind margin and at sides; basal marginal stria distinct. *Scutellum* usually obsolete, narrow and strongly convex when present; entire scutellar area of mesonotum with numerous pearly scales. *Elytra* ovate-acuminate, proportions fairly constant and similar in the two sexes (10 : 6·7–7·1); humeral tubercle obsolete or absent in male, small to moderate and sharp in female; post-humeral spine large, axis coincident with that of fellow or inclined weakly (rarely strongly) anteriad, tip reflexed posteriad; each elytron with four large dorsal spines: one post-median (and longest) in interstria 2, two medians in interstriae 3 and 5 and one pre-median in interstria 4; dorsal spines more elongate in male than in female (Text-figs. 19, 20); interstriae 2, 3, 5 and 7 on disc each with a regular row of rounded or sharp granules (sometimes poorly developed in male), 3 and 5 in addition with single large pre-basal granule or callus; isolated granule (rarely two) usually present on interstria 5 at level of post-median spine; further very small isolated granule sometimes present on interstria 3 between level of post-median spine and apex; interstriae 3, 5 and 7–9 all strongly convex posteriorly (7 usually bare and shiny); 3 and 9 unite short of apex forming a prominent Y-shaped elevation.

*Vestiture* dense but more or less discontinuous. Head and rostrum with dense round white scales, imbricate below eye; centre of frons bare; vertex with mixed pale and bronzy scales; dorsal setae erect brown and conspicuous. *Prothorax* with median, adlateral and lateral white stripes, anterior end of adlateral stripes incurved and frequently detached as a pair of separate admedian patches; underside with imbricate, predominantly bronzy scales. Elytra in Lake Grace and Albany specimens (Text-fig. 61) with a sharply defined series of white imbricate-scaled interstrial tracts, thus: on interstria 1 from base to level of posterior side of post-median spine; on 2 at base only (to level of anterior side of pre-median spine); on 4 from base about to level of post-median spine, interrupted by pre-median spine which it narrowly ascends posteriorly; on 6 throughout, except for short gap in middle; on 8 throughout, including humerus and uniting posteriorly with tract on 6; on anterior half of 9 and 10 (plus marginal strip), here sprinkled with olive-brown scales and ascending post-humeral spine dorsally to near its apex; remaining areas with very thin, closely appressed, translucent scales (hence appearing bare) or with brown scales, notably on declivity from suture to stria 4. In the Albany specimen, tracts on anterior part of interstria 5 and posterior part of 8 are indistinct or missing but there are additional short tracts on 2 and 5 immediately behind (and narrowly ascending) post-median and outer median spines respectively; a further short tract on 7 unites hind end of foreshortened tract on 8 with those on 6 and 5 to form a large oblique patch. Similar but less well defined markings occur in the Bridgetown and Hester specimens (none of which is fresh).

*Legs* with femora slender; fore and middle tibiae incurved towards apex, teeth moderate, corbels with both fringes complete and with numerous adventitious setae but no scales; scales mixed bronzy and pearly, imbricate-tessellate throughout, mainly pearly on femora, mainly bronzy on tarsi; setae brown, rather conspicuous. *Venter* without post-coxal cavities but anterior marginal stria sometimes very deeply impressed in both sexes; imbricate white scales present at sides of ventrites 2–5, elsewhere with mixed pale and dark (or hyaline) scales. *Aedeagus* stout, terete, smooth, not widening at level of phallotreme; apex rather short, tip blunt, scarcely swollen, not deflexed. *Ovipositor* short, valves apposed, evenly tapering, about as high as together broad.

Holotype ♂. WESTERN AUSTRALIA: Bridgetown, 1919–206, in the Western Australian Museum, Perth.

Paratypes. 1 ♂, 2 ♀, same data as holotype (2 W, 1 BM(NH)); 3 ♂, 5 ♀, same locality (*J. Clark*) (3 FEW, 2 V, 2 S, 1 BM(NH)); 2 ♂, 3 ♀, same locality, i.1914 (*H. J. C[arter?]*) (3 A, 2 V); 1 ♂, 1 ♀, same locality (*Lea*) (S); 2 ♀, same locality (printed label) (BM(NH), V); 2 ♂, W. Australia (Bridgetown on series label), Macleay coll. (Macleay); 1 ♂, 1 ♀, Hester (*J. Clark*) (BM(NH)); 1 ♂, 1 ♀, Lake Grace (S); 1 ♂, Albany, Pascoe coll. (BM(NH)); 1 ♂, Adelaide (*Plason*) (Dresden); 1 ♂, 3 ♀, W. Australia (no further data) (3 V, 1 A); 1 ♂, ditto, G. Masters coll. (Macleay); 1 ♂, 1 ♀, with '6420/W.A.' (in red) (S); 1 ♂, without data, Chevrolat coll. (Stockholm). Total: 37 specimens.

Localities: Bridgetown; Hester; Lake Grace. The record for Albany is likely to be highly inaccurate and that for Adelaide is obviously false.

This very distinctive species has been repeatedly misidentified in collections as *C. tribulus* Pasc. (= *C. lepidus* Pasc.) to which it bears little resemblance. Furthermore, the row of tubercles in interstria 1 by which Pascoe separates *C. tribulus* in his key does not occur in the present species.

The spiniest species. The name was proposed by Marshall (i. litt.).

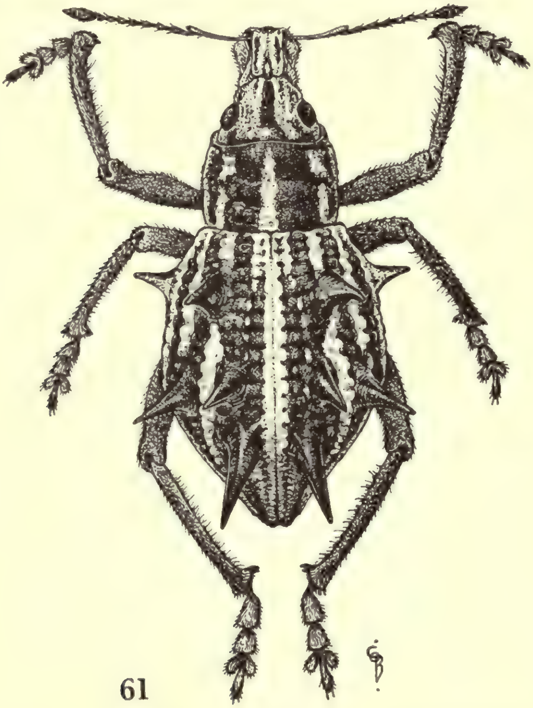


FIG. 61. *Catasarcus murex* sp. n. ♂ (Lake Grace).

### *Catasarcus armatus* Blackburn

(Text-figs. 21, 62, Maps 1, 4)

*Catasarcus armatus* Blackburn, 1893 : 271.
*Catasarcus spinipennis*; Froggatt, 1907 : 182 [?].
*Catasarcus armatus* Blackburn; Lea, 1918 : 267.

Length 9·5–15·5 mm. Entirely black (legs brown in teneral specimens). Scales dense throughout, bronzy with ill-defined pattern of whitish or golden scales; scanty brown powdery exudate often present. *Head* with frons flat or weakly convex, usually with prominent tectiform or rounded, smooth or striated median cariniform elevation, extending from near transverse furrow to vertex (if absent, wide area of frons strongly striated); lateral frontal carinae well developed, sharp, parallel, each more or less strongly incurved anteriorly and continued posteriorly above eye to its hind margin; admedian carinae straight, strongly converging anteriorly where they are equidistant from laterals and each other and distinctly higher than laterals; eyes oblong-acuminate, × 1·5 as long as broad and very weakly convex. *Rostrum* < × 1·2 as long as broad, strongly widening at genae which are abruptly truncate apically; epistome large, triangular, flat, finely pitted and microreticulate; median carina not always clearly defined from epistome, sometimes microreticulate, more or less strongly raised or upturned at base and projecting over the very deep transverse furrow; projection usually emphasized by oblique basal carinae, elevation emphasized by declivity of hind angles of dorsal area; latter usually strongly sulcate in front of oblique basal carinae; chin weak. *Antennae* with lengths of funicle segments 1–3 in ratio 2·2 : 1·7 : 1 (mean of seven); vestiture throughout, or at least on segment 7, composed partly to almost entirely of very small dark scales and not differing greatly in appearance from that of club; pale scales tend to be confined to mesal side of each segment when in minority. *Prothorax* transverse (10 : 14·8–17·6), subcylindrical; sides converging anteriorly; post-ocular lobes large, somewhat angulate; sides and dorsal surface (except anterior third) with more or less distinct granules; both transverse striae distinct and almost or quite complete. *Scutellum* as in *C. carbo*. *Elytra* globose-acuminate (10 : 6·9–7·6); base wider than base of prothorax and more or less distinctly excavated; humeral tubercle absent in male (but sides of base prominent), large sharp and pre-basal in female; post-humeral spine small; each elytron (Text-fig. 21) with four dorsal spines: large posterior spine in interstria 2 at top of very steep declivity (almost vertical in female); two smaller, broadly conical spines in interstriae 3 and 4 on line between posterior spine and shoulder; similar fourth spine in interstria 5 about at level of that in 3 and completing equilateral triangle with this and spine in 4; foremost or outermost spine occasionally obsolete in both sexes; posterior pair long, subcylindrical, weakly diverging or parallel or even converging in male; in female shorter, more evenly tapering, weakly diverging; disc of elytra with transverse folds and strongly raised sharp or rounded granules, notably in female along interstria 7 from humeral tubercle to about level of foremost dorsal spine; female also has large granule or callus at or near base of interstria 3 and sometimes also 2 (traces of these often present in male). *Legs* as in *C. carbo* but corbel without scales and outer fringe of setae normal; few to many adventitious setae present; clothing setae small, dark and inconspicuous. *Venter* in male with deep post-coxal groove and ventrite 1 with prominent bead-like granules at sides.

*Vestiture* uniformly dense except on spines and larger tubercles. Scales mainly whitish on rostrum and underside of head (dense but seldom imbricate below eye); whitish or golden on frons, with admedian carinae completely covered; mostly bronzy on centre of frons and vertex but thinly sprinkled with pale blue metallic scales; bronzy on prothorax, densely sprinkled with whitish scales in mid-line and at sides; mainly bronzy on elytra but usually whitish or golden along suture, at base, along costal margin (interstria 10 anteriorly, 9 posteriorly), on interstria 4 between spines on adjacent interstriae and in most strial punctures. Venter with mixed light and dark scales but only light at sides of each ventrite. Setae throughout small, dark recumbent and inconspicuous.

*Aedeagus* terete, smooth, scarcely widening at level of phallotreme; apex narrow but tip rather broadly rounded, very weakly deflexed. *Ovipositor* with valves explanate, strongly flattened and blade-like.

Holotype ♀, with '1315/W. A.' (red), 'T.' (black, on same label) and 'Catasarcus/armatus, Blackb.' (in Blackburn's hand), in BM(NH). Marshall has added the following data, given with the description: 'W. Australia/Gnarlbine/French'. The range of dimensions given by Blackburn indicates a series of specimens, though he states that the description is based on one only. Two specimens (not seen) in the South Australian Museum, without localities, may be paratypes.

A total of 43 specimens has been seen.

The range of this species is so vast, compared with all the other species, and so uncertain that it seems desirable to give the data of the available specimens in full: WESTERN AUSTRALIA: 1 ♀, Gnarlbine [Gnarlbine Rock] (*French*) (BM(NH)); 1 ♂, Kalgoorlie (*Du B*[*oulay*]) (V) (also recorded for this locality by Lea, 1918 : 267); 1 ♂, 1 ♀, Coolgardie (*Du B*[*oulay*]) (V); 1 ♂, 1 ♀, Dedari, 23–25.i.1962 (*A. M. Douglas* and *L. N. McKenna*) (W); 1 ♂, 1 ♀, Innes district, 126° E., 27° S., v–vi.1964 (*M. Gillett*) (W); 1 ♂, Beverley (*F. H. du B*[*oulay*]) (A); 1 ♂, same locality, K. K. Spence coll. (A). NORTHERN TERRITORY: 1 ♂, Ayer's Rock, 2.v.1952 ('*Aust. Museum N. W. Aust. party*') (A). SOUTH AUSTRALIA: 2 ♂, 1 ♀, Ooldea (*A. M. Lea*) (S); 1 ♂, Fowlers Bay, 2.xii.1901 (*Maurice*) (S); 1 ♂, same locality, 16.v.1901, 'Pres. by R. T. Maurice 16–5–01' (V); 1 ♀, same locality, 'K 12,011' (A); 1 ♂, Fisher [Fisher Siding] (*Le Souëf*) (V). In addition to these fairly precise records, there exists a series of 4 ♂, 6 ♀, labelled: 'Everard Rgs., S. A./to Warburton Rgs., W. A./A. Brumby' (7 S, 3 BM(NH)). The records for Beverley are unlikely to be genuine.

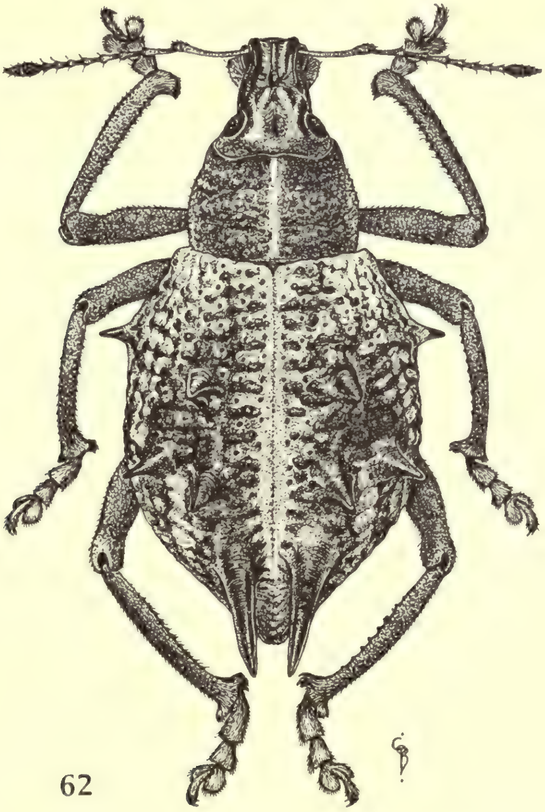


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FIG. 62. *Catasarcus armatus* Blackburn ♂.

Specimens of this species have been taken by A. M. Douglas at Seemore Downs on the Nullarbor Plain, ix.1967. This is roughly midway between the Kalgoorlie and South Australian records. This information was received too late for inclusion on Map I (p. 361).

Host-plants. The Dedari specimens were taken on 'small stunted Eucalypt'. Mr. Douglas (personal communication) adds, 'Conditions very dry with Mallee and *Triodia* the only vegetation nearby'.

The holotype is a very large (15·5 mm.), teneral female. It is not as 'sparingly supplied with scales' as it looks; being teneral, the entire cuticle is brown so that only the pale scales are evident. These pale scales vary in different specimens from white, through various shades of brown, to a fiery golden red colour. The colouring may result, at least partly, from the presence of powdery exudate. Although specimens taken together have scales of similar colour, there is no clear evidence that this, or any other form of variation is territorially restricted. This is indeed astonishing in view of the subspeciation observed in several other species with very much smaller ranges.

### ***Catasarcus lepidus*** Pascoe

(Text-figs. 22, 63)

*Catasarcus lepidus* Pascoe, 1870 : 17, 39.
*Catasarcus trapa* Pascoe, 1870 : 17, 38, **syn. n.**
*Catasarcus furfuraceus* Pascoe, 1870 : 17, 39, **syn. n.**
*Catasarcus tribulus* Pascoe, 1870 : 17, 40, **syn. n.**

Length 10–14 mm. Black; antennae, parts of legs and tips of all elytral spines very dark red. Scales dense, mostly sombre but with whitish scales forming a simple pattern on elytra (Text-fig. 63); no powdery exudate observed. *Head* subglobular; lateral frontal carinae absent; admedian carinae short, not or very poorly defined externally and strongly converging anteriorly; eyes small, rounded (× 1·3 as long as broad), weakly to moderately convex; middle of frons even, smooth; median sulcus deep, smooth, sometimes with a few striations or carinulae. *Rostrum* × 1·1–1·2 as long as broad, strongly widening apically; epistome well defined, transverse, disc weakly depressed, finely microreticulate, with two small setae in median cleft; dorsal area declivous posteriorly and there much narrower than between antennal insertions, thus leaving more of shelf above scrobes exposed (in dorsal view); median carina tenuous and obscured by scales anteriorly, broad tectiform raised and projecting beak-like posteriorly over abbreviated transverse furrow; chin well marked. *Antennae* with lengths of funicle segments 1–3 in ratio 3·15 : 1·7 : 1 (mean of eight); segment 7 from as long as broad to × 1·5 as long. *Prothorax* as in *C. carbo* (10 : 14·3–15·8) but median stripe less distinct. *Scutellum* as in *C. carbo* but brown scales often present. *Elytra* broadly ovate-acuminate (10 : 6·8–7·4); humeral tubercle absent in male, small sharp and pre-basal in female; post-humeral spine in male large and slender, often curving dorsad or posteriad, in female less elongate and not or less strongly curved; each elytron (Text-fig. 22) with four main dorsal spines: large posterior spine in interstria 2 at top of declivity; slightly shorter anterior spine in interstria 3, in line with posterior spine; two smaller spines in interstria 5, one adjacent to anterior spine, the other between level of post-humeral spine and base; all spines longer in male than in female; striae impressed throughout, punctures deep in male, shallow in female, disc without transverse folds but with variable number of sharp tubercles, especially along interstriae 2 and 3 and around basal spine; sometimes small accessory basal spine present on interstria 3 between anterior spine and base; occasionally a row of small tubercles present along outer side of interstria 1 (otherwise smooth). *Legs* as in *C. carbo* but segment 3 of tarsi smaller. *Venter* with no post-coxal cavities or deep groove in male; granules at sides of ventrite 1 small.

*Vestiture* composed of very dense or imbricate, mainly olive-brown or bronzy scales but brilliant white at sides of elytra on interstriae 7 and 8; pale area behind shoulders (as in *C. carbo*); suture pale but scales mostly pale olive-brown; striae and punctures bare in male, producing striped effect. Remainder of body and head fairly uniform; scales olive-brown thinly to densely sprinkled with pearly white scales. Such vestiture covers entire rostrum, including median carina (but not epistome) and head, except median frontal sulcus; eye sometimes very narrowly encircled with white (cf. *C. carbo*). Prothorax with pale (but not brilliant) median stripe only. Antennae and legs as in *C. carbo*.

*Aedeagus* similar to that of *C. spinipennis*; somewhat flattened above, otherwise terete and smooth; apex strongly tapering, tip weakly deflexed. *Ovipositor* with valves explanate and strongly depressed.

The following are in BM(NH):

Holotype of *lepidus*, ♂, with 'Champion B.' and 'Catasarcus/lepidus/*type* Pasc.' Almost certainly unique. There are two further specimens from the Pascoe coll. (one with an extra spine in interstria 3 in front of the anterior spine) and one from the Fry coll. ('De Boulay/Swan R.'), determined by Pascoe.

Holotype of *trapa*, ♀, with 'Champion B.' and 'Catasarcus/trapa/*type* Pasc.' Unique.

Holotype of *furfuraceus*, ♂, with 'Champion B.' and 'Catasarcus/furfuraceus/*type* Pasc.' Unique.

Holotype of *tribulus*, ♀, with 'West Australia' (not Champion Bay, as stated by Pascoe) and 'Catasarcus/tribulus/*type* Pasc.' Almost certainly unique. A specimen from Pascoe's supplementary collection (without locality) and another from the Fry collection ('De Boulay/Swan R.') have been determined as this species by Pascoe.

A total of 17 specimens has been seen (12 BM(NH), 4 Oxford, 1 V).

Localities. None certain. The Victoria Museum specimen bears a label in F. E. Wilson's hand, 'Mayanup, W. A./H. Baker' but I am inclined to doubt the validity of this record. The Swan River record from the Fry collection is thought to be false for the reasons given on p. 430 above, although one of the Oxford specimens is labelled: 'Swan River/West Australia/De Boulay 1869'.

Pascoe described the sexes of this weevil as distinct species, thus the holotype of *C. lepidus* is a normal male while that of *C. trapa* is a normal female; that of *C. furfuraceus* is a male contaminated with extraneous granules; that of *C. tribulus* is a female with a row of small raised granules along interstria 1.

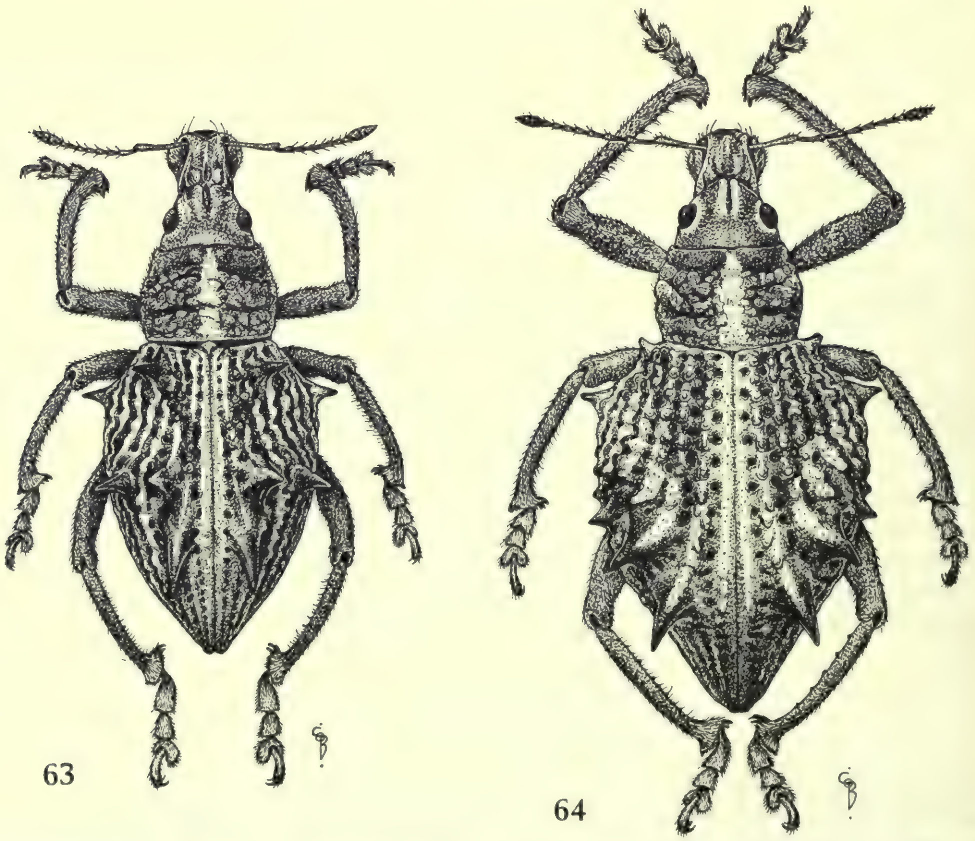
Males of this species bear a striking resemblance to those of *C. carbo* (southern form), their additional dorsal spines notwithstanding.

### ***Catasarcus carbo*** Pascoe

(Text-figs. 23, 59, 64, Map 4)

*Catasarcus carbo* Pascoe, 1870 : 16, 35.
*Catasarcus spinipennis* Fåhraeus (?), var. *insignis* Lea, 1917 : 721, **syn. et stat. n.**

Length 10·5–15·5 mm. Black; antennae, legs and elytral spines dark red. Scales below and at sides imbricate and mostly pearly, above similar or greenish, in patches forming a regular pattern, punctures bare; setae on body very small and dark; no powdery exudate observed. *Head* with frons weakly convex; lateral frontal carinae reduced, very broadly rounded, usually partially subdivided, often obsolete; admedian carinae broad, variable in size, usually straight and weakly converging anteriorly (rarely strongly curved); median frontal sulcus also variable, extending posteriorly to level of middle of eyes; middle of frons smooth or finely striated, flat or with trace of median elevation; eyes × 1·2 as long as broad, very strongly convex, sometimes bun-shaped. *Rostrum* as in *C. lepidus*. *Antennae* with lengths of funicle segments 1–3 in ratio 2·8 : 1·6 : 1 (mean of nine), 7 about × 1·5 as long as broad. *Prothorax* transverse (10 : 13·7–16·1), broadest about middle; sides weakly to strongly rounded, usually subparallel in basal half; post-ocular lobes obsolete or weak, vibrissae short; dorsal surface with complete smooth or weakly impressed median line which bisects a prominent transverse swelling near anterior margin; disc on either side of line with strongly raised rugae and granules, with smaller, more regular granules towards the sides; anterior transverse stria usually lost among the granules, posterior stria abbreviated or deformed but very deep. *Scutellum* not abruptly raised; entire scutellar area of mesonotum densely squamose. *Elytra* ovate-acuminate (10 : 6·6–7·3); humeral tubercle in male obsolete or very small and rounded, in female pre-basal, small to moderate, and very sharp (sometimes spiniform); post-humeral spine small to moderate, axis usually inclined antero-dorsad; dorsal spines as in *C. spinipennis*, posterior longer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Figs. 63, 64. 63, *Catasarcus lepidus* Pascoe ♂ (holotype) 64, *C. carbo* Pascoe ♀.

in male (Text-fig. 23) than in female and less rapidly tapering (often subcylindrical), × 0·9–1·2 (anterior) and 1·7–1·9 (posterior) as long as broad at base in male, × 0·8–1 and 1·2–1·4 respectively in female; striae distinctly to strongly impressed on disc and at sides; interstria 1 flat and smooth, interstriae 2–6 (–7) on disc with very strong elevations opposite gaps between successive strial punctures; these elevations may take the form of rounded granules which unite transversely to form irregular sinuous transverse folds, deeply incised by the striae (as in *C. intermedius*), or sharp spiniform granules, or a combination of the two; above a certain height, the latter have red tips and when isolated resemble accessory dorsal spines, notably in some females (Text-fig. 64) on interstria 5 at its flexure below the anterior spine and on interstria 4 in front of this spine. *Legs* with tibial teeth small and fairly regular; corbels narrow, more or less filled with appressed subhexagonal or oblong-acuminate brilliant pearly white scales, together with up to ten adventitious setae, outer fringe of setae defective; tarsi with claw-segment × 0·7–0·8 as long as 2 + 3 in male, × 0·8–0·9 as long in female. *Venter* as in *C. lepidus*.

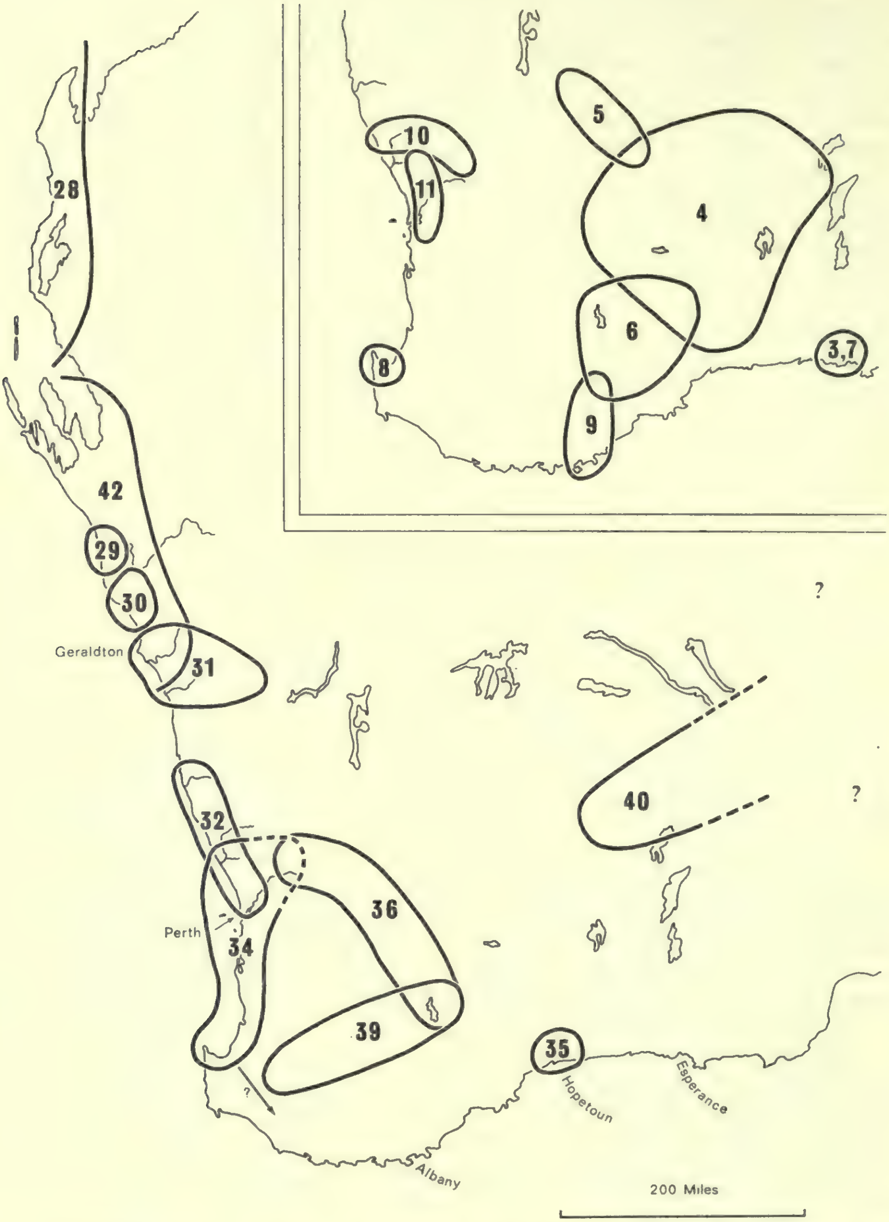
*Vestiture* very variable. Underside throughout (including head) with imbricate whitish scales, often with strong metallic pink, coppery and green reflections and often with a proportion of light or dark bronzy scales intermixed. Eyes encircled with white imbricate scales; rest of head (above) and rostrum with very dense whitish and bronzy scales mixed in wide range of proportions. Prothorax with narrow median tract of imbricate closely appressed white scales (sometimes some with vivid golden reflection), flanked by broad tracts of dense, mainly bronzy scales which cover the rugae and granules but leave at least the deeper interspaces bare; sides with dense whitish scales. Elytra typically with strial punctures, most striae and high elevations bare; sides with dense, often brilliant, whitish scales, usually with a narrow irregular tract of bronzy scales along middle of each interstria; declivity with mainly bronzy scales; disc of each elytron with a series of dense scale-patches forming an oblique tract from anterior dorsal spine to post-humeral spine. In specimens from Shark Bay and Murchison River Reserve these and other areas have imbricate but loose, often mostly acuminate, metallic golden yellow and green scales, thus: on interstria 1 from base to declivity; on interstriae 2–6 at extreme base; they form patches on interstria 2 in front of posterior spine (sometimes obsolete) and on 3 in front of anterior spine, ascending base of spine in each case; a large irregular patch near the anterior spine and anterior to it, extending over interstriae 4–6 and they cover a large area below and behind dorsal spines on interstriae 2–5. These areas are flat, with small strial punctures and scattered small black spots, where very small setiferous granules project between the scales; remainder of dorsal area sparsely squamose, hence dark in strong contrast to patches. Specimens from Eradu have pale areas very ill-defined and composed of round appressed pearly scales, similar to whitish ones at sides; interspaces more densely covered with mainly bronzy scales. Other specimens, from unknown localities, have almost no trace of pale areas. Antennae and legs with scales imbricate throughout, bright pearly and dull bronzy mixed in various proportions.

*Aedeagus* slender, apex unusually variable (Text-figs, 59*a–c*), the variation not related to variation in vestiture. *Ovipositor* similar to that of *C. lepidus*.

Holotype of *carbo*, ♂, with ' West Australia ' and ' carbo ' in BM(NH). Unique (' My specimen ').

Holotype of *insignis*, ♂, with ' Sharks/Bay. WA ' and ' Ty of var insignis Lea ' (the latter in Lea's hand), in the South Australian Museum, Adelaide.

Paratype ♂, with same locality label as holotype but no other label (S). The BM(NH) specimen mentioned by Lea cannot be recognized with certainty but may be a large female from Pascoe's main collection which bears a label ' E/48 ' only. Four further specimens are known with locality labels similar to those of the types and so presumably belong to the same series (2 V, 1 A, 1 Dresden). One of the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30
Geraldton
31
32
Perth
34
36
39
?
35
Hopetoun
Esperance
Albany
40
?
?
200 Miles

Map 4. *Catasarcus* spp. Ranges. 3, *bakeri*; 4, *obesus*; 5, *aspergetus*; 6, *azureipes*; 7, *varus*; 8, *ustulatus*; 9, *rugulosus*; 10, *aerosus*; 11, *griseus*; 28, *intermedius*; 29, *albipectus*; 30, *bicolor*; 31, *echidna*; 32, *nephelodes*; 34, *spinipennis*; 35, *concretus*; 36, *marginispinis*; 39, *murex*; 40, *armatus*; 42, *carbo*.

Victoria Museum specimens bears an accession label subscribed ' Pres by/C. French/ F.L.S. 19.1.10 '.

A total of 16 specimens seen.

Localities: Shark Bay; Murchison River Reserve (FHUB); Eradu (*J. Clark*) (FEW). A further Pascoe specimen is labelled ' Champion B.' and a Fry specimen ' De/ Boulay; ' Nov. Holl./Swan R.' The data of the foregoing specimens support my contention (p. 430 above) that the Fry specimen and others from that collection with the same data were taken around Geraldton, not Perth.

In spite of having only four dorsal elytral spines, this species is very closely related to *C. lepidus*. They have in common the only squamose corbels in the genus; the prothorax more strongly rugose on the disc than at the sides (instead of *vice versa*) and with a bifid thickening near the anterior margin; they also have round, convex eyes and very similar vestiture, a distinctive feature of which is a tendency to have bare striae, especially in the male.

Pascoe's description is based on a severely abraded (and partly bleached) specimen. This is singularly unfortunate since, as a result, one of Australia's most attractive insects must bear a wholly inappropriate name.

## CHECK-LIST OF SPECIES (INCLUDING SYNONYMS, ETC.)

1. ***transversalis*** Germar **sp. rev.**
    (not syn. of *stygmatipennis* (Boisduval)).
2. ***t. anatolicus*** ssp. n.
3. ***bakeri*** sp. n.
4. ***obesus*** sp. n.
5. ***aspergetus*** sp. n.
6. ***azureipes*** sp. n.
7. ***varus*** sp. n.
8. ***ustulatus*** sp. n.
9. ***rugulosus*** Boheman
10. ***aerosus*** sp. n.
11. ***griseus*** Pascoe
12. ***latheticus*** sp. n.
13. ***bilineatus*** Fåhraeus
    *suturalis* Pascoe **syn. n.**
14. ***sericeus*** Blackburn
15. ***hopei*** Fåhraeus
    *vinosus* Pascoe **syn. n.**
    *effloratus* Pascoe **syn. n.**
    *ovinus* Pascoe **syn. n.**
16. ***carinaticeps*** Lea
17. ***frontalis*** sp. n.
18. ***opimus*** Pascoe
    *ceratus* Pascoe **syn. n.**
    *granulatus* Lea **syn. n.**
19. ***pallidiventris*** sp. n.
20. ***asphaltinus*** sp. n.
21. ***longicornis*** Pascoe
22. ***cygnensis*** sp. n.
23. ***coruscus*** sp. n.
24. ***laevior*** sp. n.
25. ***impressipennis*** (Boisduval)
    *stygmatipennis* (Boisduval) **syn. n.**
    *rufipes* Fåhraeus
    *pollinosus* Pascoe **syn. n.**
    *foveatus* Pascoe **syn. n.**
    *maculatus* Pascoe **syn. n.**
    *mollis* Lea **syn. n.**
    *durus* Lea **syn. n.**
26. ***inaequalis*** sp. n.
27. ***memnonius*** Pascoe **sp. rev.**
    (not syn. of *stygmatipennis* (Boisduval)).
28. ***intermedius*** Pascoe
29. ***albipectus*** sp. n.
30. ***bicolor*** sp. n.
31. ***echidna*** Pascoe
    *bellicosus* Pascoe **syn. n.**
    *araneus* Pascoe **syn. n.**
    *humerosus* Pascoe **syn. n.**
    *funereus* Pascoe **syn. n.**
    *brevicollis* Pascoe **syn. n.**
    *scordalus* Pascoe **syn. n.**
32. ***nephelodes*** sp. n.
33. ***albuminosus*** Pascoe
34. ***spinipennis*** Fåhraeus
    *ericius* Pascoe **syn. n.**
    *nitidulus* Pascoe **syn. n.**
35. ***concretus*** Pascoe
36. ***marginispinis*** Pascoe
37. ***albisparsus*** Pascoe
    *capito* Pascoe **syn. n.**
38. ***cicatricosus*** Pascoe
    *ochraceus* Pascoe **syn. n.**
39. ***murex*** sp. n.
40. ***armatus*** Blackburn
41. ***lepidus*** Pascoe
    *trapa* Pascoe **syn. n.**
    *furfuraceus* Pascoe **syn. n.**
    *tribulus* Pascoe **syn. n.**
42. ***carbo*** Pascoe
    *insignis* Lea **syn. et stat. n.** (not var. of *spinipennis* Fåhraeus)

*Onesorus farinosus* (Blackburn, 1896: 288) **comb. n.** (ex *Catasarcus*).

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## PLATE 1

FIGS. 1, 2. *Catasarcus ustulatus* sp. n. ♀ (holotype) (BM(NH) Neg. Nos. 43283, 43282).

FIGS. 3, 4. *C. inaequalis* sp. n. ♂ (holotype) (BM(NH) Neg. Nos. 43279, 43278).

FIG. 5. Specimen believed to be an aberration of *C. coruscus* sp. n. (see p. 416) (BM(NH) Neg. No. 43280).

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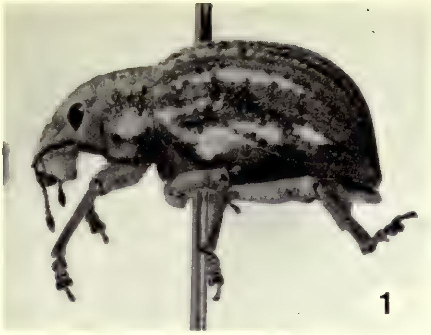

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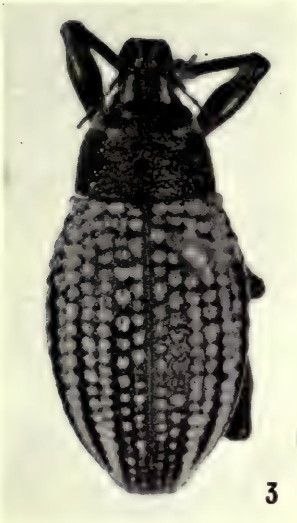

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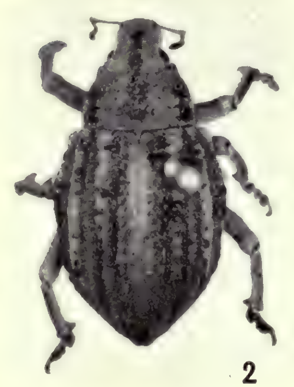

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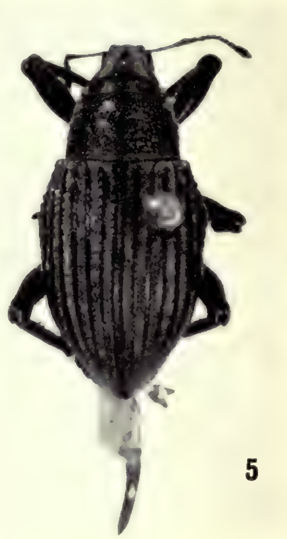

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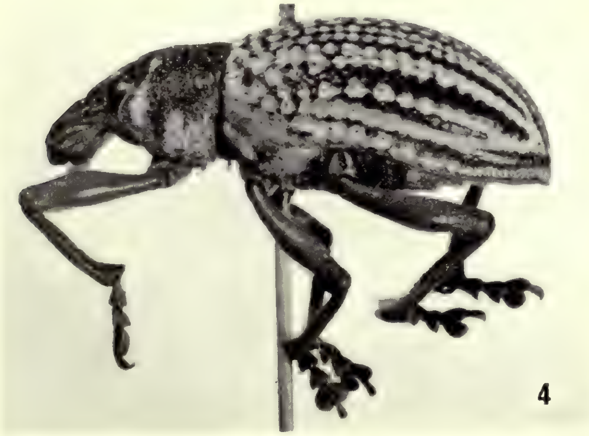

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